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Nature Magazine

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VOLUME 34 NUMBER 1

JANUARY 1941

35 CENTS

Pep Up Your Meetings

Motion pictures of Nature and the Outdoors will take you far and wide in the world of the wild.

Schools; Garden Clubs; Women's Clubs; Nature and Hiking Clubs; Boy and Girl Scout Troops; Church, Civic and Fraternal Organizations; Sportsman and Conservation Groups will be interested in these motion picture films. Thrilling, educational motion pictures help to boost attendance at meetings. They make meetings more interesting and help to promote some educational activities by increasing a knowledge of Nature and the outdoors; developing a consciousness of the need for practical conservation of our national resources and the protection of wildlife.

FILMING WILDLIFE REQUIRES TIME, PATIENCE AND ENDURANCE

For forty years William L. Finley has been shooting wildlife. But everything he has shot still lives for it was shot with a motion picture camera. More than two hundred thousand feet of film now carry the record of his camera hunting.

The American Nature Association commissioned Dr. Finley to edit eighteen 400-foot reels of 16 millimeter motion picture film, drawing upon the best of his material. Thus 200,000 feet of 35 millimeter film are condensed into the equivalent of 18,000 feet of the best shots of all.

These interesting, entertaining and educational films are grouped as follows:

GROUP I: Specially adapted for school use and for juvenile audiences.

11. *Babes in the Woods:* The life of Nature's young in the wild.
12. *Wild Animal Pets:* A naturalist's dog into whose life came many strange animals.
13. *Renting Houses for Songs:* An intimate study of bird life.

GROUP II: A spectacular series of Alaskan reels.

21. *Cruising North:* Murres, sea puffins, bear and other coastal wildlife.
22. *Off to Glacier Bay:* Spectacular pictures of the face of a glacier breaking off and plunging into the bay. Also wildlife scenes.
23. *Wild Animal Outposts:* Hardy Island deer, ptarmigan, bear cubs, blue fox, fur seals of the Pribilofs.
24. *Thar She Blows:* Whales at sea.
25. *Great Bear of Alaska:* Films of the great Kodiak bears of Admiralty Island.

GROUP III: Southwestern series.

31. *Wings to the South:* Bird life of the Texas Gulf coast and the southwest.
32. *Riding the Rimrock:* Searching the rough country of the southwest for its wildlife.
33. *Nature's Side Show:* The struggle for existence in the arid southwest.
34. *Queer Creatures of the Cactus Country:* A study in the adaptation of wildlife to a harsh land.
35. *Getting Personal with Mountain Lions.* A thrilling picture of a pack trip into lion country.

GROUP IV: Photographed along the Continental Divide.

41. *The Big Game Parade:* You meet Antelope, Mountain Sheep, Mule Deer, Elk, Bison, Moose, Brown Bears and Grizzlies.
42. *The Forests:* Forest Fires, Birds, Beaver—greatest conservationist of all—at work.
43. *When Mountains Call:* The life of the high places is thrilling to see. Water Ouzel, Ptarmigan, American Eagle, Big Horn Sheep, Wapiti—American cousin of the European Stag.
44. *Ramparts of the North:* Filming big game requires endurance. Glaciers, Hoary Marmot, Caribou, Moose, Black Bear.
45. *Getting Our Goat:* Mountain Goat on its native crags. Ground Squirrels, Cony, Grouse.

AVAILABLE AT A NOMINAL RENTAL

The Association will pay expressage or postage when films are shipped to customers. The customer will pay return mailing charges and will be responsible for films until returned to 1214 Sixteenth Street, N.W., Washington, D. C. Rentals will be shipped C. O. D. unless paid for in advance.

Films are to be shipped back the day after showing. No extra charge for time consumed in transit.

When reservations are made, customers are urged to select 1 or 2 alternate choices.

RENTAL RATE

Group I—3 reels	$3.00
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Single Reels or any multiple of those available—each reel	$1.00

MAIL YOUR ORDER FOR FILMS
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to
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American Nature Association
1214 Sixteenth St., N. W.,
Washington, D. C.

Layman Scientists

That there are many men and women interested in various branches of science in an amateurish way is, of course, a matter of common knowledge. The real extent of this interest, however, is largely a matter of estimate and guess. Therefore particular significance attaches to the publication of a booklet entitled *The Layman Scientist in Philadelphia,* because it reveals the extent of this activity in a surprising manner. Under a grant from the Carnegie Corporation of New York, the Committee on Education and Participation in Science of the American Philosophical Society made a study of the Philadelphia area. It was found that more than 32,000 persons participate in the scientific activities of 287 amateur groups. These range from the Amateur Astronomers of the Franklin Institute to the Zoological Society of Philadelphia. They include groups interested in various branches of the physical sciences; in agriculture, archæology, aviation, conservation, gardening and horticulture, mechanics and model-making, photography, and radio. This booklet lists the groups with pertinent details about their organization and objectives; gives information on scientific and other institutions of interest to amateur scientists in the vicinity of Philadelphia, and describes educational opportunities in science for adults. Besides being a most useful publication for science-minded laymen in that region, it is illuminating as an indication of the scope of lay interest and activity generally. Similar studies could well be made in other cities. Copies of the booklet are available for fifteen cents from W. Stephen Thomas, American Philosophical Society, 104 South 5th St., Philadelphia, Pa.

Hawk Leaflet

"Hawks are magnificent and spectacular forms of life which have not been accorded the protection and appreciation that is due them." So says Dr. Ira N. Gabrielson, Director of the Fish and Wildlife Service, in his introduction to *Common Hawks of North America.* This is a leaflet just brought out by the Emergency Conservation Committee, 734 Lexington Avenue, New York City. It is the joint work of Rosalie Edge and Ellsworth D. Lumley, and is a splendid presentation of the truth about hawks and the situation that faces these birds because of the prejudice and ignorance concerning them. Although designed as a school leaflet, this publication is equally of value in adult education with respect to hawks. Copies are available at ten cents each from the Emergency Conservation Committee.

Hijacking Ants

Members of the Soil Conservation Service staff on a project near Temple, Texas, discovered that red ants accumulate large quantities of buffalo-grass seed, piling them around their hills, probably as a source of winter feed. This seed material, swept together with a stiff brush and run through a commercial seed cleaner, yields quantities of seed. Eight hundred pounds of waste matter from the ant hill produced two hundred pounds of seed that, experiments show, serves well in point of purity and germination.

Here is *more* than a Circus Parade

NEVER could you find in the most extravagant Circus Parade all that we want to send you. Never could you see in any one Zoo the birds, the fish, the animals we want to show to you. Never without much travel and tramping could you examine in all their many colored beauty, the flowers and trees we want to lay before your eyes.

BUT NOW . . . now, through the service of the National Wildlife Federation . . . you can see this gay circus parade, this superlative zoo, this superb collection of trees and flowers. Through researches culminating in 1938, 1939 and 1940, we can bring you one hundred twenty **miniature prints** in gummed poster stamp form—pictures reproduced in many colors—pictures of 49 birds, 19 fish, 28 mammals, 10 trees and 14 flowers. They were painted by the group of twelve outstanding nature artists listed on this page.

If you were to buy these beautiful poster stamps separately, the complete set would cost you $1.40. And yet the National Wildlife Federation, to advance the cause of wildlife and the conservation of America's other natural resources, offers them to you for $1.

To give permanence to this collection of 120 full color pictures, the Federation will send you two Poster Stamp Albums. In these there are spaces for each of the 120 stamps and under each stamp there is an interesting description of every bird, animal, fish, tree and flower pictured.

Contributing Artists

Jacob Bates Abbott
J. N. (Ding) Darling
John Joseph Eppensteiner
Fred Everett
Lynn Bogue Hunt
Francis Lee Jaques
W. G. Lawrence
Roger T. Peterson
Leslie Ragan
Morgan Stinemetz
George M. Sutton
Walter A. Weber

And in addition—if you will tear out and use **the handy coupon below**—the National Wildlife Federation will include its new booklet, "Plant Collecting: An Enjoyable Hobby."

What a huge dollar's worth! First, 120 beautiful miniature color prints as described; Second, two Albums with spaces for every stamp so that as you leaf through you will see the marvelous Parade; Third, the booklet on Plant Collecting—total value of all, $1.85.

Send for this Nature Lovers Collection for yourself. Send for it and keep it to make a Christmas gift for a boy or girl, man or woman who glories in the great outdoors. Send the coupon below with your $1 to the National Wildlife Federation at Washington, D. C.

One-Eighth Actual Size

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Department NA-2, 1212 Sixteenth Street, N. W.
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Camera Trails

BY NORRIS W. HARKNESS

The Contest

I'm almost sorry the 1940 Camera Trails Contest has come to its end. It has been most interesting to see the prints come in—more than 800 of them from 37 states, Canada, Mexico, and the Philippines. Watching Dr. Anthony and Mr. Lootens, our judges, make their selections has been even more interesting and helpful. At times it was difficult for them to decide between half a dozen prints and to give the necessary weight to the pictorial value and the Nature value of the pictures, or to deal fairly with widely varying subject matter.

During their deliberations I took notes—notes I will pass along to you from time to time—but I wish each of you could have gone over the entire group with them to hear their comments. You would have heard a lot about the choice of the right grade of paper for the prints, the use of high enough shutter speeds to stop the motion of the subject, exposure, and imagination or the lack of it. Some of those comments would not have made you feel any better; others would have made your ears burn very nicely; all of them would have helped you to make better pictures.

This is the perfect time to express my own thanks, and yours, to Dr. Anthony and Mr. Lootens. Both of them have given generously of their time to make our contest better and neither of them has much time to spare.

But I almost forgot to name the winner of the final prize. The twenty winning prints of the monthly contests were presented to each judge and rated by them in the order of his preference. Both named the same print as the best of the entire contest—"A Foxy Fellow" by R. E. Hart of Clearwater, Florida, one of the winners in the December issue. The first honorable mention was to John J. Stophlet of Toledo, Ohio, for his "Male Least Bittern on Nest," printed in the June-July issue, and the second mention went to V. A. Winn of Crook, Colorado, for his shot of the "Cicada and Pupa Case" in March.

Mr. Hart has received his $25 certificate from Willoughby's as the final prize.

May I express my sincere congratulations to these gentlemen on the excellence of their pictures, and my thanks to every Camera Trailer who entered prints in the contest and contributed to its success.

Lenses

Most of us know lenses as the glass gadgets on the front of the camera that let in the light—and that is really all we must know about them. However, we can make a tool more valuable if we understand a little of how it works.

The earliest lens was not a lens at all, but a tiny hole in a thin disc of paper or silver. It was designed to let into the camera one ray of light, and only one, from each part of the scene being photographed. Since the amount of light that could get through the hole was so small, the exposures were long, but these pin-holes, as they are known, had the advantage of making everything equally sharp on the negative regardless of the distance of the object from the camera.

"A FOXY FELLOW"—PICTURE BY R. E. HART OF CLEARWATER, FLORIDA, TO WHICH THE JUDGES AWARDED THE GRAND PRIZE FOR 1940 IN NATURE MAGAZINE'S PHOTOGRAPHIC CONTEST

Further advance in our knowledge of optics resulted in the glass lens more or less as we know it. The lens admitted a great deal more light in a given time, but rendered sharply only a comparatively small part of the visible field. This, however, is an advantage since we can pick out that part of the picture area that we wish to show in perfect detail and make the remainder less distinct by throwing it out of focus—the desired part being focused upon by changing the distance from the lens to the plane of the film.

The early lenses were not corrected, which means simply that they showed lines and circles somewhat distorted and not as they should be. The meniscus lens, like that found on the cheapest box cameras today, is of this type. Later it was found that using two of these simple lenses together, with the diaphragm between them, gave straight lines, and the combination was called the rapid rectilinear, because of the linear correction and the fact that they could be used at a larger aperture and hence were faster.

Still further advance gave us the highly corrected anastigmat that reproduces all lines and figures correctly and brings the different colors into focus in the same plane, a correction that is gained by using different kinds of glass in the assembly of the various elements.

These, then, are the different classes of lenses from the standpoint of their optical characteristics and their accuracy, but lenses are also classified mechanically by their focal length. This term merely means the distance from the optical center of the lens—usually nearly at the diaphragm—to the film when the camera is focused on a distant object, or on the infinity mark of the focusing scale. As a rule the focal length of the lens on your camera is slightly longer than the diagonal of the film area it is intended to cover. This is known as the normal focal length for that film size, and almost all cameras are equipped with a normal lens. It generally includes an angle of view—the angle that the camera records on the negative—of about forty-five degrees.

The next type of lens is the wide angle, which, as its name implies, includes a wider angle than the normal lens. The angle varies with different lenses and the size of the film with which they are used, but it generally is about seventy degrees. One very special lens was made with an angle of nearly one hundred eighty degrees, but most of them include less than ninety.

These wide angle lenses have a focal length that is shorter than the diagonal of the negative and are specially ground so that they may cover the larger area. This covering means the ability of the lens to reproduce accurately, both in correctness of line and equality of exposure, all objects wherever they may be in the picture area, and if a lens not properly ground is used on too big a negative, the corners will be less sharp than the center and under-exposed as compared to the center area.

Wide angle lenses are used for interiors and for shots that must be made at very short distances since they are capable of taking in a larger part of the scene.

Lenses whose focal length is greater than the diagonal of the film include a smaller angle of view but show each object on a larger scale than do the shorter lenses. Their chief purpose, then, is to give us a bigger image at the same focusing distance, as in the case of photographing a bird's nest without disturbing the bird. Such a lens may be of the same design as the normal lens, in which event it is referred to as just a long focal length lens, but they are heavy and bulky for ordinary use. To obtain the same large image, the manufacturers have made lenses of the same long focal length but designed on the plan of the telescope so that they may be smaller and more convenient. They call them

telephoto lenses and offer them for sale for any camera whose lenses may be interchanged.

But I have said that longer lenses provide a larger image at the same distance. The image size is proportional to the focal length of the lens. If we consider a 3¼" by 4¼" camera, the diagonal of the negative is about 5½", and the normal lens would have a focal length of 5½" or 6". The wide angle lens might have 3" or 4" focal length and the telephoto might be of any length from ten inches up. If the image of an object is one inch high with the 3" lens, it would be two inches high with the 6" and four inches in height if the telephoto had a length of 12"—if all the shots were made from the same distance.

These are the main facts we should know about lenses. Later I will take up the question of the uses of the diaphragm and how the present marking system came to be adopted. If you have further questions on lenses, write me.

This and That

Happy New Year! May 1941 be the best year you have yet known and the worst the future holds for you. And may it bring you many of the kind of pictures you most want to make.

It is the season for snow pictures and you will want plenty of them. Remember to use a side lighting whenever it is possible; never to make a snow shot without a lens hood; to expose accurately. In case of doubt as to the exact exposure, make two or three shots with different stops or shutter speeds to be sure of the right one, and use a light or medium yellow filter.

Willoughby's, 110 West 32nd Street, New York City, have announced the Hudson Print Press, an all-metal press for prints up to 8 x 10 or 11 x 14 inches. Their bargain booklet is also ready. Mention this department when writing them.

The Goodspeed Company, 220 Fifth Avenue, New York City, have introduced a coupled range-finder for several Bell and Howell cameras. Write to them for details.

Burke and James, 223 West Madison Street, Chicago, Illinois, have a large camera that will interest serious photographers. It is the Watson, a 5 x 7 view camera that is low in price. You all know Burke and James and their many products. Write for their catalog.

Two devices are now available to adapt larger cameras to the use of Bantam size Kodachrome. The first, for the vest pocket Exakta, retails for $4.50 and is produced by the Photo Marketing Corp., 10 West 43rd Street, New York City. The other, the Essankay Color Adapter, converts cameras that use 120 film and is distributed by the Raygram Corp., 425 Fourth Avenue, New York City. If your dealer hasn't in stock the one you want write to the proper company above for information.

The Fink Roselieve Corp., 109 West 64th Street, New York City, has introduced an electronic timing device that works on AC or DC for the perfect timing of enlargements and the lights for copying work, tabletop photography, etc. I have been using one in my dark room for six weeks or so and recommend it highly, as a convenience and time saver. Its retail price is $12.50. The same company distributes Develochrome, a new toning developer created by Anton Bruehl for a simplified method of direct development of prints in practically any color. Finished black and white prints may be bleached and redeveloped the preferred color, and movie titles may also be toned easily, provided that they have simply been developed and fixed. It is not advisable, however, to attempt the toning of movie films that have been reversed.

Remember that your camera probably received fairly rough treatment on your vacation and undoubtedly needs a thorough cleaning. The safest tools, as I have mentioned here before, are a rubber ear syringe to blow out the dirt that you have loosened with a small camel's hair brush. Be careful of the lens, and if there is dirt on it that does not come off easily, have it removed by a lens expert.

The Edwal Laboratories, 732 Federal Street, Chicago, Illinois, have announced a new hurry-up fixing bath called Quick-Fix that not only gets your negatives out of the bath quickly but also hardens the emulsion well. Write for details on Quick-Fix and their other products and mention Camera Trails.

Movie makers who want to do their own processing will want the catalog of the Superior Bulk Film Company, 188 West Randolph Street, Chicago, Illinois. Their 110 foot reel works splendidly.

A booklet has been published by the Kalart Company, makers of the Kalart Synchronizers and Kalart Coupled Range-Finders entitled "How to Put Life into Your Pictures". We have arranged to obtain a supply of these booklets and will send one to you if you enclose a three-cent stamp with your request.

Camera Trails is edited for Nature readers who are interested in photography and maintains a service to render assistance with any photographic problem. You are invited to take advantage of this service or to suggest subjects for discussion in these columns. Address your communications to Norris W. Harkness, Camera Trails, 1214 Sixteenth Street, N.W., Washington, D. C.

Seed Bulletin

Seeds and Their Dispersal is the title of the August, 1940, issue of Science Guide for Elementary Schools, published by the California State Department of Education. Written by Vesta Holt, Professor of Biological Science at Chico State College, this bulletin presents the subject in effective form, the text being supplemented by good pictures and drawings. These bulletins are distributed free to the California public elementary and junior high schools. To those outside California single copies are available at twenty-five cents; a complete volume at one dollar.

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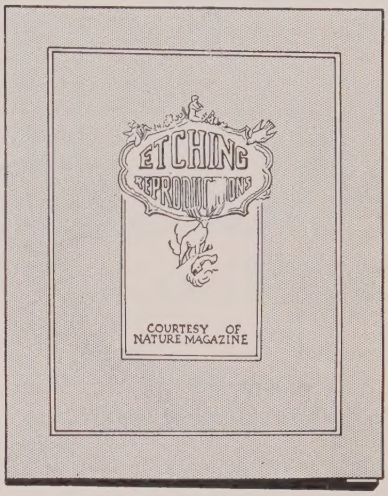

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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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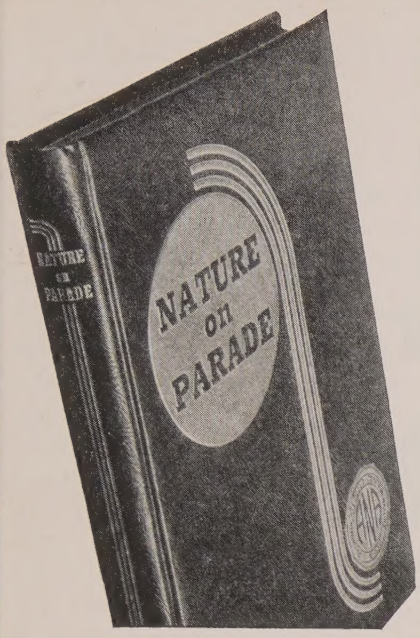

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A Nut Collection

The special educational insert in our October, 1940, issue entitled "Nuts" particularly appealed to E. H. Fellbaum, superintendent of schools in Plentywood, Montana, who wrote in to express his appreciation, and to say that he is trying to build a school science museum and that the current project is a nut exhibit. He wants to obtain specimens of nuts, leaves of the trees from which they come and other material relating to this study. There being no central agency from which such material could be acquired, it becomes a question of friendly gift or exchange. If your school is engaged in some similar activity perhaps you could help out the folks in Plentywood, and they could aid you as well.

National Park Visitors

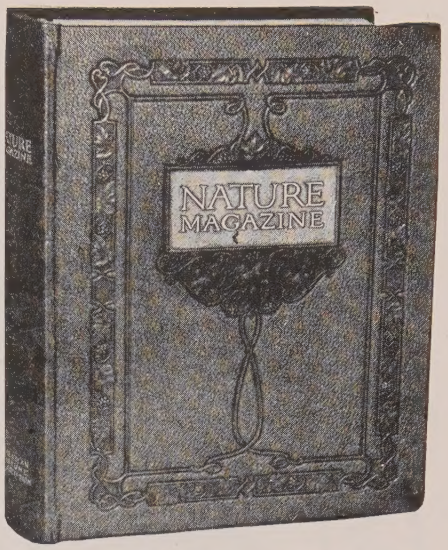
The number of visitors to the National Parks and Monuments established a new record during the travel year of 1940, with a total of 16,741,855 men, women and children checked into such areas. While there was undoubtedly some duplication, with the same individuals visiting more than one area during their vacations, the figure represents an increase of about 400 per cent since 1933. Visitors to the National Parks, the nucleus of the system, totalled 7,369,596, an increase of eight per cent over 1939 figures. Shenandoah National Park in Virginia had the highest total, with the Great Smoky Mountains National Park in second place.

On the Radio

Two new science programs have made their bow on the air over the networks of the National Broadcasting Company. One, entitled "Unlimited Horizons", originates on the West Coast and is a result of the collaboration of Stanford University, the University of California and the California Institute of Technology. It is broadcast Fridays on the Red Network from 8:30 to 9:00 P.M., Pacific Standard Time, and one hour later in each of the three time zones as we move eastward, reaching the Eastern Time Zone air at 11:30 to 12:00. The other program is entitled "Man and the World" and is produced through the collaboration of the American Museum of Natural History and the Museum of Science and Industry. It goes on the air over the Blue Network on Saturday evenings from 8:15 to 8:30, E.S.T., and correspondingly one hour earlier as we move West.

Toledo Birds

The most recent local ornithology to come to hand is entitled *Birds of Lucas County,* and is published by the Toledo Zoological Society. Written by Louis W. Campbell, Honorary Curator of Ornithology, this 225-page book deals with the birds indigenous to or migrant through this northern Ohio county, with brief observation as to the general status of the bird under discussion in Ohio. His book is a record of observation and habitat and not an identification text, but will be of much value and interest to bird students in Ohio. The edition is limited and copies are 50 cents each from the Museum of Science, Toledo, Ohio.



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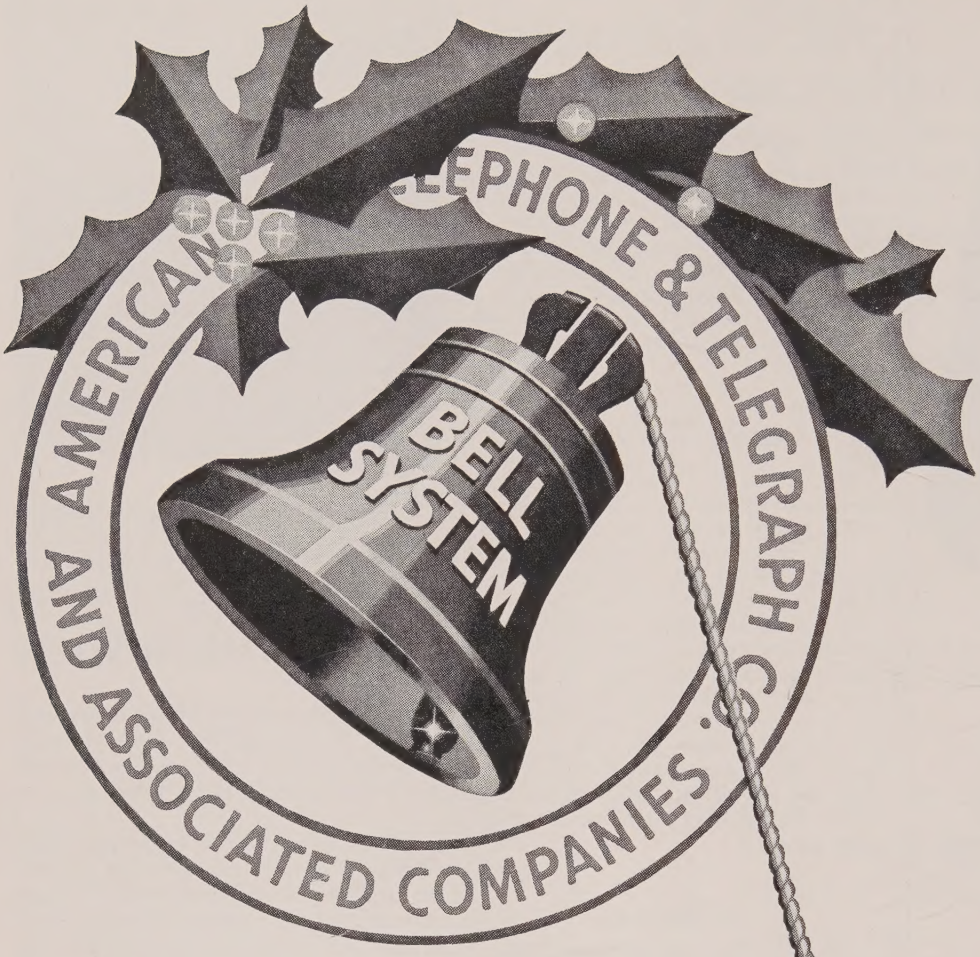

"Best Wishes for Your Happiness"

from your friends and neighbors in the telephone company. May the friendly spirit of the holidays carry through all of 1941.

BELL TELEPHONE SYSTEM

Nature in Print

By HOWARD ZAHNISER

THOSE who have learned to follow trails left in the snow by the wild creatures and to read in these trails, like a detective, the tales of travel, combat, and escape, or tragedy, have in many instances gone to school first of all with the help of track and trail drawings by Ernest Thompson Seton. Not only have they learned to read tales for themselves but they have carried with them to the outdoors an anticipation of excitement induced by Seton's own writings, in more than a dozen and a half of books. In 1904, after the famous nature-writing controversy that was a sensation in American literary circles, John Burroughs wrote: "Some are Nature students, dryly scientific, some are sentimental, some are sensational and a few are altogether admirable. Mr. Thompson Seton, as an artist and a raconteur, ranks by far the highest in this field; he is truly delightful." Now past eighty years, Mr. Seton has retraced his own *Trail of an Artist-Naturalist,** with the help of many of his own illustrations, demonstrating his continuing high rank.

Although somewhat dissipated by its telling in a rather discursive vein of reminiscence, the excitement of Seton's own life history is almost as remarkable as that of many of the wild creatures he has known. This account of an immigrant lad on a Canadian backwoods farm, who struggled later for an education in Toronto and in art schools of London and Paris, pioneered in Manitoba and the Southwest, and became a success in New York, is a document in the American literature of Nature that proves again the wide sweep of American opportunity and its rewards for enterprise and perseverance. There is, of course, nothing lost through understatement, and the account is interspersed with the inevitable excitement of anecdote and tale-telling. The rat that Seton captured as a boy and took to a man seeking rodent food for captive rattlesnakes is the hero of a tale as good as any that Seton has spun into fiction. The cornered rat, dying from venom, killed all four of the rattlers before it finally succumbed, and for once a reader finds himself in sympathy with a rat. Seton's facts, as he proved in *Life Histories of Northern Animals* and in *Lives of Game Animals,* can be as interesting as the realism that he transfused into fiction. *Trail of an Artist-Naturalist* is a further demonstration.

Seton's autobiography makes it plain that there was an early conflict between his own zeal for natural history and a father's determination that his son should be an artist. The result is indicated in the autobiography's title, but it is also apparent that the son was victorious in the compromise. Natural history won out in either case, but it seems likely that Seton's great and somewhat sudden success as a writer sidetracked his development as an artist.

Seton's account of his art-school days indicates great promise. He remarks that one student whom he outrivaled in exhibits "rose to the topmost level of American painters," while he himself was "still known merely as an illustrator." "This," says Seton, "seems to prove something, but I don't know what it is." It probably proves that, with few exceptions, Seton's literary activities never permitted his art to develop beyond illustration. Probably it was better so. The autobiography again demonstrates that the drawings and writings are both essential parts of a whole that constitutes an unique life work.

Seton's illustration of other men's writings was recently recalled by the publication of Arthur H. Howell's *Revision of the North American Ground Squirrels,* the last book published by one of the country's leading mammalogists. Eleven color plates made by Seton and printed more than 40 years earlier, filed by the Government but not forgotten, add the touch that the "dryly scientific," to use Burroughs's phrase, can not have. These plates alone should make of this work a collector's item, for not only are they colored illustrations with a colorful history, but they are also signed "Ernest E. Thompson," recalling Seton's own problem in nomenclature, a problem that is discussed in an appendix of *Trail of an Artist-Naturalist,* providing one of the book's peculiar interests.

Although Seton is a gifted illustrator in a specialized field and although his life histories of animals are invaluable, it seems that his fame is greatest as tale-teller. No boy who has read his books—and few have not—can ever fail to have some interest in the wild. Yet to those who have known Seton personally it seems that his telling of tales orally is most memorable. Fortunately he has had an ardent and constant listener in Mrs. Seton, and she has done some collecting. Her *Trail and Camp-Fire Stories* is a hand-sized volume that should find its way along many trails to many (Continued on page 50)

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*Books discussed in this article are:

Trail of an Artist-Naturalist: The Autobiography of Ernest Thompson Seton. New York: Charles Scribner's Sons. 1940. 412 pp., with index, frontispiece photograph, and numerous illustrations by the author. $3.75.

Revision of the North American Ground Squirrels, with a Classification of the North American Sciuridae. (North American Fauna No. 56.) By Arthur H. Howell. Washington: United States Department of Agriculture: Bureau of Biological Survey. 1938. 256 pp., with index, bibliography, 20 range maps, and 32 plates, including 11 in color by Ernest E. Thompson, "now known as Ernest Thompson Seton." 40 cents, from Superintendent of Documents, Washington, D. C.

Ernest Thompson Seton's Trail and Camp-Fire Stories. Edited by Julia M. Seton. New York and London: D. Appleton-Century Company, Incorporated. 1940. 155 pp., with a preface by Ernest Thompson Seton, and an introduction by the editor. $1.

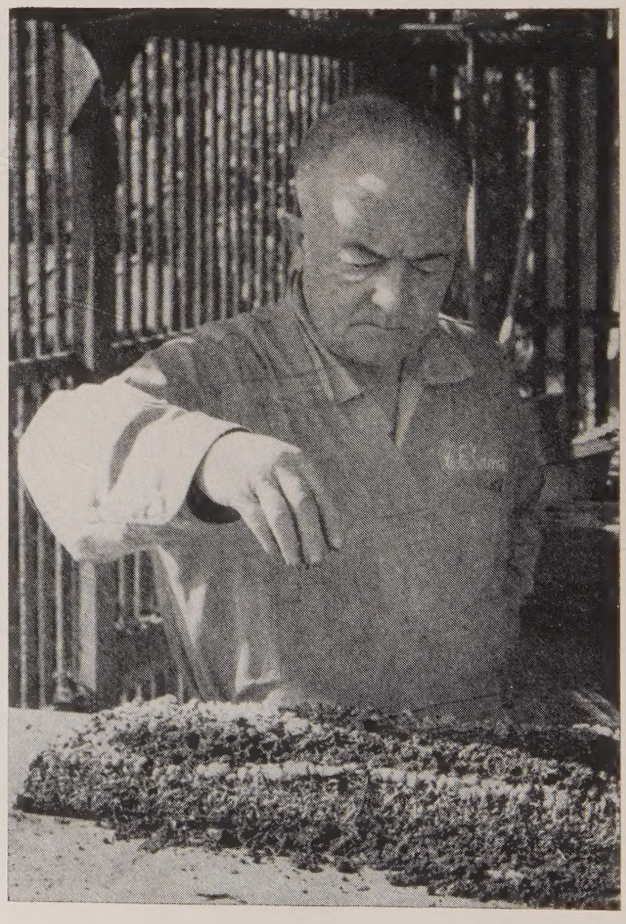
The Earth Speaks. By Princess Atalie. New York, London, and Edinburgh: Fleming H. Revell Company. 1940. 224 pp., with decorations and 24 illustrations by the author. $2.50.

The Boy Scouts' Year Book of Wild-Animal Stories. Edited by Franklin K. Mathiews. New York and London: D. Appleton-Century Company, Incorporated. 1940. 295 pp., with introduction by James E. West and 20 illustrations by Charles Livingston Bull, Enos B. Comstock, and A. Conway Peyton. $2.

Animals as Friends and How to Keep Them. By Margaret Shaw and James Fisher. New York: E. P. Dutton & Co., Inc. 1940. 271 pp., with index, bibliographical references, foreword by Julian Huxley, 21 diagrams of homes for pets, and 16 photographs by W. Suschitzky. $2.50.

SOME SIDELIGHTS ON THE VALUE OF EARTHWORMS TO MAN

A ball of compost spaded from one of Dr. George Sheffield Oliver's earthworm culture beds. These are large, native California worms produced specially as food for frogs, turtles, ducks and fowl. A farmer who raises bullfrogs for the Los Angeles market displays some big fellows that have been grown largely on a diet of earthworms from his own culture beds. A Rhode Island Red pullet, five months old, is already laying her quota of Grade A eggs. She is fed on what Dr. Oliver calls "intensive range", and her board bill is only one-tenth of one cent a day. Dr. Oliver prepares some of this feed before setting it out on the feeding board. This highly-nourishing diet consists of sprouted grain, mixed with earthworms and with earthworm egg capsules



NATURE MAGAZINE
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Harnessing Earthworms

Subterranean workers prove boon to agriculture

By JOHN EDWIN HOGG

Photographs by the Author

"AND HE gave it for his opinion, that whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together."

Jonathan Swift in *Gulliver's Travels*

In 1881, Charles Robert Darwin, the great English scientist, after years of patient study, published a book of 236 pages dealing exclusively with earthworms. In this volume, *The Formation of Vegetable Mould through the Action of Worms,* he makes it clear that Nature apparently created the earthworm to be an improver of the soil and to aid the growth of plants. Indeed, he goes so far as to make this statement: "Without the work of this humble creature, who knows nothing of the benefits he confers upon mankind, agriculture, as we know it, would be very difficult, if not wholly impossible."

A CONTRAST IN CASTOR BEANS

These are grown for commercial and medicinal oil, and the oil content determines their market value. The beans at the left were grown in ordinary California soil; those at the right in the same kind of soil well worked by earthworms. The oil content of the latter group of beans is almost one hundred per cent greater, and both their size and appearance offer a remarkable contrast

TWO STRIKING EXAMPLES OF EARTHWORM VALUE TO PLANT GROWTH

Two four-month-old avocado trees planted simultaneously. Except for earthworms in the soil of the one at the right and no earthworms in the pot at the left, growing conditions were identical. At the experiment station in the Angeles National Forest Dr. Oliver has carried on other experiments. Seeds that produced these Douglas firs were planted at the same time, one in wormless soil, the other in soil with worms. Both seedlings have been growing eight months, but with the aid of the earthworms the one at the right has already produced a seed cone; the other gives no sign of such achievement and is a decidedly spindling treelet

No machinery of human invention is ever likely to be a substitute for the functions of the earthworm. Every earthworm is an amazing combination of chemist and borer, and has the voracity of a grist mill; it is constantly devouring earth, dead leaves and other decomposing organic material. Everything it swallows is pulverized in its chicken-like gizzard. From this it extracts its sustenance, adds the end-products of its body metabolism and passes it out in the form of numerous castings. Earthworm castings are a perfect form of soil humus. They are one of the richest plant foods known to civilized man.

Further soil improvements result from aeration through myriads of worm tunnels. Oxidation and nitrification are speeded in soils so ventilated. The various bacteria, an important factor in the formation of humus, are more readily admitted to soils well-perforated with wormholes. Every wormhole is also a watering tube through which rain is stored in the ground at a depth of six feet, or more.

By a careful census Darwin estimated that two and a half million earthworms is a moderate infestation for a healthy English acre. That number of worms, he estimated, will annually contribute about eighteen tons of castings to the fertility of the acre. In addition to this valuable donation, fertility is further increased by aeration, the conservation of moisture and the conversion of many tons of dormant sub-soil into rich top-soil available for plant growth. Without the work of the worms these desirable soil improvements are inhibited.

The fly-leaf record of a copy of Darwin's book, before me as these lines are written, indicates that it has been out of the local public library only fourteen times in the twenty-eight years since the library was established. Nevertheless, anyone with a spark of imagination may read it today to find every basic suggestion for the science of bio-kinetic farming, the ultra-modern science of harnessing the earthworm to bring agricultural practices into permanent and profitable harmony with the unalterable laws of Nature.

No such suggestion was ever acted upon during Darwin's lifetime. And even today politically-dominated agricultural science has failed to take advantage of the economic value in the earthworm. Fortunately, however, there are at least two pioneers of science who, many years ago, accepted the work of the world's most outstanding biologist of modern times, to make further research their life's work. One of these gentlemen is Dr. Ehrenfried Pfeiffer, the Holland-Dutch wizard of agriculture, whose book *Bio-Dynamic Farming and Gardening,* recently published at Dornach, Switzerland, has been translated into

PACKING EARTHWORMS

They are removed from a master culture bed and packed, five hundred to the tin, in damp peat moss. A case shipment would comprise about ten thousand worms, and they can easily be shipped anywhere with success and little loss of earthworms

numerous languages to become a European best seller—even in the dictator countries, completely uncensored. The other is Dr. George Sheffield Oliver, whose experimental farm in Los Angeles County produced the scientific facts for his three-volume work *Our Friend the Earthworm* (an outline of bio-kinetic methods), which, since its publication in 1937, has rescued hundreds of American farmers from impending bankruptcy and helped their acres to productivity.

Within these space limits it is impossible to discuss the work of both these scientists who, over a period of some thirty years, have pioneered identical fields of biological research with parallel results, each without ever having heard of the other until less than a year ago. Only because Dr. Oliver's Earthworm Farms in California are more accessible to the writer than Dr. Pfeiffer's experimental farm in Holland, this article is restricted to the work of the American.

In 1906, Dr. George Sheffield Oliver, a descendant of James Oliver, inventor of the steel plough, was a prosperous young physician and surgeon in Fort Worth, Texas. He was living at the time on a five-acre estate on the outskirts of the city, and there Darwin's book came to his attention. Being a curious-minded fellow, whose hobby was gardening, he did much reading between the lines, and this suggested some interesting experiments he could easily undertake upon his own property.

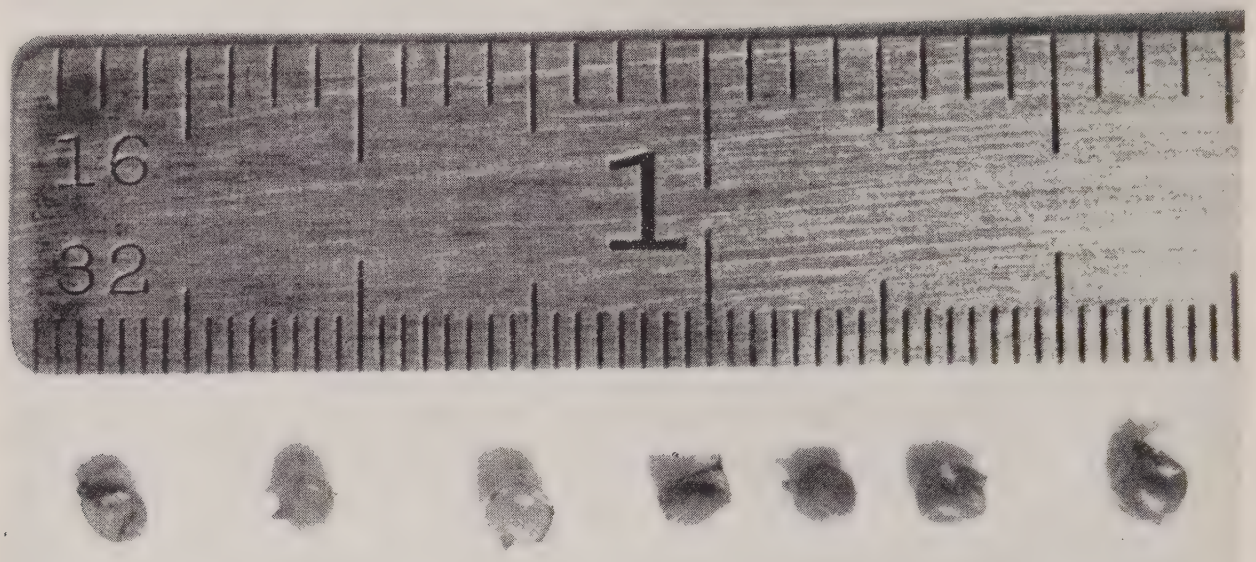
To test some of Darwin's statements, Dr. Oliver procured numerous large flower pots, and for purposes of identification, painted half of them green and the others red. Then in each pair of red and green pots he made simultaneous plantings of flowers and common garden vegetables. In the red pots, however, he had carefully sifted the top-soil to be certain it contained no earthworms or earthworm egg capsules, while in each of the green pots he placed a few earthworms.

Some weeks later he had unquestionable evidence that Darwin was right. The plants in the green pots grew much faster; they were stronger, healthier and nearly twice the size of those in the red pots. Equally promising was the fact that, while some of the plants in the red pots were damaged by insects, the pests ignored the more luxuriant plants grown in the worm-worked soil.

After many similar experiments, with results always the same, he began experimenting with the propagation of earthworms in artificial culture beds. The effort became a success. He soon found that raising earthworms literally by the billions is largely a matter of making a home for them, feeding them well and encouraging them to be

SELECTING BREEDERS

Commercial earthworm culture seems to appeal particularly to women, elderly men or persons suffering from minor physical handicaps. There is practically no heavy labor involved



EARTHWORM EGG CAPSULES LOOK LIKE LEMONS UNDER THE MAGNIFYING GLASS

Each egg capsule, after thirty days' incubation in the ground, hatches out from twelve to sixteen baby worms. They will become egg layers in about ninety days, so the speed of earthworm reproduction assures the raiser and farmer of a plentiful supply

fruitful. With an abundant supply of earthworms for further experiments, he began "planting" them in his gardens, around his fruit trees and all over the property. Here he began getting results similar to those of the potted plant experiments—better trees, better flowers, better garden vegetables, faster growth and a high-degree of immunity from attack by insect pests. Such minor pest troubles as he had were duly eliminated by the development and use of several non-poisonous, insect-repelling sprays.

Eventually the word got about through Fort Worth and Dallas that Dr. Oliver had some magic formula for making things grow. His friends were amazed by the beauty of his trees, the gorgeousness of his flowers, and the great size and superior flavor of strawberries and everything else from his gardens. When they asked how he did it, the physician replied: "It's a secret. Some day, perhaps, I'll reveal it—after I've retired from medical practice."

He did not realize then how close to retirement he really was. When he refused to disclose his gardening secrets, wealthy friends began offering him tempting sums to apply them upon their property. Dr. Oliver finally accepted one such offer and the job was little more than completed before he had another. Two years later he sold his medical practice, and opened an office in Dallas and another in Fort Worth. The lettering on these office doors read: George Sheffield Oliver—Landscape Engineer.

During the next several years Dr. Oliver went from one large landscaping contract to another and rolled up a comfortable personal fortune beautifying parks, cemeteries and various other types of public and private estates. With the cooperation of billions of earthworms whose work never faltered, he so improved properties in two years as to give them the appearance of having had at least five years of intensive landscape gardening. All the while he was guarding the secret of how he did it—and hoping that no one with imagination would ever read that musty old book of Darwin's to take a few tips and become his competitor!

About 1920, the fame of the man in Texas who seemed to possess some sort of a magic wand for the beautification of landscapes, trickled to the Pacific Coast and he was lured to Los Angeles with some fat contracts for improving the estates of various motion picture stars. For the next few years he was more than busy and scarcely interested in jobs calling for an expenditure of less than $10,000. Nevertheless, he found time to establish a ten-acre experimental farm in a remote corner of Los Angeles County. And there, in the field and in the laboratory, where visitors were never permitted behind high-board, barbed-wire-topped fences, the earthworm researches went steadily on year after year—with results such as Darwin never dreamed of!

Secrecy was discarded after 1929, when, with depression conditions, Dr. Oliver became convinced that putting earthworms to work—harmonizing agricultural practices with the self-enforcing laws of Nature—is of outstanding importance in the cure of American agriculture, now suffering from a thousand man-made ills. Today he is recognized by laymen and scientific men alike as the world's greatest living authority on anything pertaining to earthworms, and particularly their applications to the restoration of farm profits and a sound economy for agriculture.

More than 1100 species of earthworms are known to science, and Dr. Oliver is the only scientist who has succeeded in hybridizing various species. He hybridizes them to produce new types peculiarly suited for specific purposes. And if anyone can find a new use for earthworms

THERE ARE TRICKS TO THE EARTHWORM TRADE

There is no digging for earthworms when it is desired to harvest them from the culture bed. Slatted boxes are filled with damp peat moss, which is baited with sugars and fats, and are placed on the culture beds. In about twenty-four hours the boxes are teeming with earthworms. Sugar and fat are their favorite foods. Dr. Oliver feeds them fat as soapy water, and sugar by using carob pods, thus foiling the tastes of California ants.

In the foreground are trays of "intensive range". These have perforated bottoms. In them grain is planted in wet peat moss, and in about 76 hours it sprouts. These trays are placed on top of the worm beds, and the worms swarm through the perforations when the starch of the grain commences to turn to sugar

he will make a worm to make good in that particular job!

The greatest task facing the earthworm today, according to Dr. Oliver, is the restoration of soil fertility by returning this servant of agriculture to the millions of acres in which it has been exterminated to the untold detriment of mankind. So, to develop a worm that is a sort of coolie soil-worker, he has a hybrid that he calls his "soilution worm", a cross between the large, English brandling and the small, native, California orchard worm. The result is a medium-sized creature of prodigious energy, prolific and hardy enough to be in demand for re-stocking the vast areas in which all native earthworms have been vanquished by the use of strong chemical fertilizers, and the poison sprays that kill the earthworms along with the insects—sometimes even the people who eat the poisoned farm products—and insectivorous birds eating the poisoned insects or earthworms.

In recent years export markets for many products of the American farm have been seriously curtailed because of residues of poison on fruits and vegetables. Because of the laxity of American state and local laws instances of people being poisoned by such contaminated foods are an almost daily newspaper topic. But foreign nations are much more fussy. Nearly every European country has enacted laws restricting such American products. These range from embargoes in some countries to milder forms of regulation in others.

For the production of a colorless, odorless, highly-volatile oil of great penetrating power, for which the medical profession is finding numerous new uses, Doctor Oliver has a short, thick little worm hybridized and dieted into disgraceful obesity! For the frog farmers, poultrymen, terrapin breeders and operators of state and private fish hatcheries and game bird farms, for whom earthworms are a partial answer to the problem of nourishing feed at small cost, Dr. Oliver has evolved still another worm. It is a big, ten-inch "meaty" creature of extraordinary vigor.

Being oviparous and hermaphroditic, every adult earthworm is an egg-layer. And by inducing them to lay most of their eggs between layers of damp burlap placed at the proper depth in the compost of culture beds, Dr. Oliver harvests a million earthworm egg capsules about as easily as he gathers a dozen eggs in his henhouse. Packed in damp peat moss, a million earthworm egg capsules make a small package that is easily shipped to any part of the civilized world. Those million egg capsules, after being transferred to suitable soil, will hatch out in about thirty days into from twelve to sixteen million tiny earthworms, which in another 90 days become adult egg-layers. Earthworm egg capsules may also be dried in the sun, held in a dormant stage for as long as eighteen months and then hatched after being returned to favorable soil.

By the use of several simple mechanical devices, Dr. Oliver also harvests earthworm castings from the compost of culture beds. These go by the hundredweight to the numerous California florists who report them the finest material they have ever discovered for boosting the growth of floral stock and making flowers bloom. For the floral trades he also manufactures a liquid fertilizer made by dripping water through boxes of earthworm castings. The resulting liquid looks like tea. It is odorless and may be stored indefinitely without the slightest deterioration. Plants receiving a small dose of it soon gain a new lease on life.

The poultry on Dr. Oliver's farm—chickens, capons and ducks—are about the finest, healthiest-looking birds ever seen outside a livestock show. They get that way on a diet that he calls "intensive range"—sprouted grain, earthworms and earthworm egg capsules. Birds receiving this highly-nutritive ration are not only boarded at a cost of about one-tenth of a cent each per day, but there are seldom any sick birds and practically no mortality. In five months a Rhode Island Red pullet weighs five and one-half pounds, looks like a two-year-old hen and is doing the egg-laying work of the two-year-old bird. And when it comes to caponizing young roosters, there is no one

quite like a former surgeon for doing it without any slips. Thus Dr. Oliver's capons become eight-pound birds in ninety days—and it costs him about fifteen cents to produce a capon easily marketed for five dollars.

The real tests of Dr. Oliver's bio-kinetic farming methods, however, have come not from his own experimental farm but from the several hundred farmers in California and practically every other state of the Union where his teachings have had as much as ten years of practical application. Today, without a solitary exception, all those farmers, who from two to ten years ago were tottering on the ragged edge of bankruptcy, are back into sound agricultural profits. By bio-kinetic processes these farmers are now growing practically everything ever commercially cultivated in the United States. And they are not "retailing their farms" with every sale of produce; with billions of earthworms cooperating with them, soil fertility is being restored faster than crops take it out. For them the renewal of soil fertility is placed on a self-replenishing, perpetual-motion basis at virtually no cost at all. In irrigated areas bio-kinetic farmers report their enterprises flourishing with much less soil cultivation and half the water bills of neighboring orthodox farms. For them, too, are solved certain problems of soil erosion, flood control and conservation of moisture. Add to these various savings the fact that the bio-kinetic farmer has little trouble with insect pests, and it would seem that Charles Robert Darwin must be credited with having laid the foundation for a long-delayed and much-to-be-desired revolution that will vastly assist American agriculture.

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"FUNNIES"

By VERNON BAILEY

THESE strange birds and mammals from western Nevada are new to science and unnamed, although tentatively placed in the genus *Funnies*. They were discovered in deep canyons and dark forests near Reno by Faith Cowgill, a graduate of the University of Nevada. Their affinities are being studied by the archaeologists of the university, and their findings will not be made public until the final report is ready for distribution in quarto form. The scientific world eagerly awaits its publication.

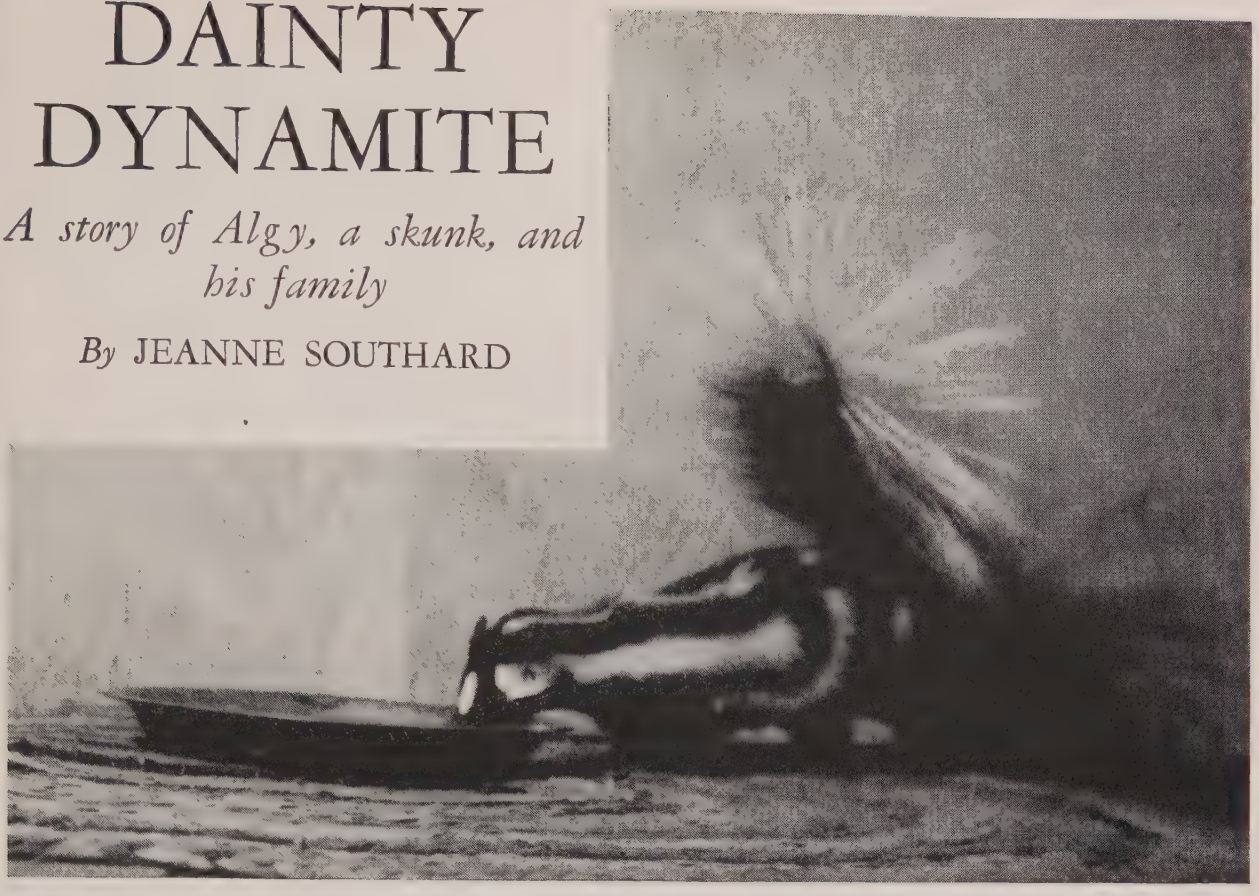
Oh, so you doubt it? All right, we'll admit that these unusual animals are made of nothing more than Brazil nuts, pecans, peanuts, pine cones and chicken feathers, with pipe cleaners for legs, horns and ears. Their eyes are black pin beads, and their joints a good quality of glue. They are not patented and there is no limit to materials and variation possible. Beside a great variety of organic material, they require imagination and ingenuity, skill with the fingers, patience and perseverance.

In fact, these fauna open a whole new field of study and exploration that have far-reaching possibilities in manual training and mental development for young and old. There is, also, no end of fun—as there should be with *Funnies*. Species will, of course, vary with different parts of the country and the number of sub-species is limited only by the originality of the maker. It would be interesting to see counterparts of these Nevada *Funnies* from other regions.

DAINTY DYNAMITE

A story of Algy, a skunk, and his family

By JEANNE SOUTHARD



IT WAS EARLY in the morning during our rainy season, when, hearing strange noises outside, I slipped into a dressing gown and slippers and sneaked out to investigate. Opening the back door I had a quick glimpse of a small animal as it scurried to the far end of the porch and tried desperately to hide a large plumy tail behind a box that barely concealed its small, black and white striped body. My excited call brought another pair of pajamas to the scene and, to me, the superior male information that that was nothing to fool with. It was, in fact, a civet cat!

The civet cat is the little spotted skunk of our southern and western states. Although not as large, he has the same formidable weapon of defense of the larger common skunk, and through that weapon commands the respect of animals much larger than himself.

Algernon, or Algy, as he is now affectionately called by the family, is about the size of a three-months-old kitten. His body color is black, but he is generously marked with snowy white stripes that begin at the top of his head and extend perhaps two-thirds the length of his body, where they are broken up by a band of solid black followed by horseshoe bands of white running around the lower back and hips. He has a small triangular face, with a white blotch between nose and forehead and others just in front of, and partly surrounding, his ears. The ears, which are fairly large, are pressed close against his head ready to catch the slightest sound. They complement his sensitive nose as he sniffs the air with as much caution as does a setter dog. Add bright shoe-button eyes and a large bushy tail, black on top with a white fringe and snowy white underneath, and you have a picture of as dainty and as friendly a little animal as it has been my pleasure to know.

This really amazing tail was the only part of him visible as he cowered in his hiding place awaiting our departure. He had undoubtedly come to our door in search of food, and it was unthinkable that on a chilly damp morning he should be turned away hungry. Despite protests and warnings I slipped quietly around the house and placed a pan of prepared dog food not too far from the sharp little nose. Then we waited behind the screen. After a few moments of cautious sniffing he darted quickly to the pan, seized a mouthful, and retired to safety to eat it. By these tactics he managed a generous breakfast. Then, violently waving *au revoir,* he scrambled up over the terrace and disappeared in the chaparral beyond.

That was by no means the end of the matter. Eager to make his further acquaintance, I put a pan of food outside each night, and before long he came regularly for his supper. For an hour or more he would take complete charge of the premises, scampering about, chittering like a magpie and waving his white plume in defiance of all the world. He even made friends with my suspicious husband, and learned to come when we called him.

Then one afternoon he appeared without warning long before dark. I was preparing dinner in the kitchen, and he seemed delighted when I handed out his scraps. Thereafter he decided he should dine at five o'clock instead of at nine or ten. Perhaps the reason for this change was the need of a few extra hours of moonlight in which to pursue the lady of his fancy, for there seemed to be an added

cheeriness to his whistle as he skirted the hillside. Not long afterward his bachelor days ended. He came one evening with a dainty, but reluctant, Mrs. Algernon, who slipped from shadow to shadow as she followed him across the yard and finally gained the refuge he had used. Cockier than ever, he carried bits of food to her from the plate and boldly demonstrated how unafraid he was.

We soon gained the newcomer's confidence. If sometimes I was a bit tardy with their meal they scampered about the porch, climbed on top of the washer, and made a great to-do. Once, hearing a scratching at the side door, I found Algy standing on his hind legs peering in through the full-length glass.

By this time Mr. S. had discovered that the two had apparently started housekeeping under one corner of the porch. They had made a neat entrance through a rock wall that permitted them to come out under the piazza at the side of the house and take a short cut through a drain pipe under the bathroom ell. That, he said, was taking our hospitality too much for granted. He repaired the rock wall and cemented around the piazza, but next morning there was a hole right up from beneath the porch, within a few feet of the drain pipe, which they used as a quick hideaway when danger threatened. However, the generous use of cement finally discouraged them and they moved to a large brush pile on the hillside.

ALGY COMES FOR DINNER

And a well-mannered guest he is, as are all the members of his now sizable family

Peace returned to our hacienda but it was short-lived. I found myself wondering how to break the news about the babies. The three of them had been proudly, but privately, displayed to me by Algernon and the Mrs. They were perfect little replicas of the old man. Each evening the mother came and took up her place as usual. Then Algernon brought the youngsters, one at a time, and tucked them safely into the drain pipe. He carried food to them there as he had at first to Mrs. Algy. He scolded noisily when they made any outcry, and admonished with a quick paw any one of them that ventured into the open when his back was turned. Mrs. A. he permitted to eat or lap milk from the pan, but for himself he reserved the right to take the last speck of canned salmon or other tidbit from my fingers.

The children have become five now, and when, toward dusk, I go to the back door and call "Algy," it is a thrilling sight to see the seven of them come tumbling, one after another, down the steep bank, white tails flying, one or more occasionally standing erect on, of all things, his front feet, or running halfway across the yard in that ludicrous position. This hand-stance, by the way, seems to be in the nature of a warning to any who would question their right in the yard. Even Tam—the big tiger cat—retires without argument. He who runs away—you know the rest.

They have all become so tame they climb on my lap and have a regular tug-o'-war over bits of bacon and raw meat. Coming from behind to climb on my bench, and from there to my shoulders, is a favorite sport. They run over my feet and chew at my fingers, and it is not unusual to have three or four of them in my lap at once begging for each morsel. Strangely enough, thus close, they have no offensive odor but only the warm pungent, wild smell known to every lover of Nature's children. They "toe-in" with their front feet, which look like little hands, and which they use in much the same way squirrels do. Often one will hold my fingers steady with his fore paws while he nibbles the food I hold. The five exceptionally long nails are not sheathed, as are those of the cat, but are always in evidence. Yet I have never received so much as the slightest scratch from one of them. They use these nails and their sharp teeth in their occasional battles with one another, but their more effective weapon is reserved for use against outsiders.

My friends often sit in the open kitchen door to watch their antics as I feed them on the brightly-lighted porch. At such times I have to keep an eye on Algernon for he takes every opportunity to slip into the kitchen and does not hesitate to climb over a guest's ankle to get there. On two occasions I have found him at midnight sitting in the middle of the kitchen floor demanding a midnight snack—or else!

We have had to rescue one or more of them from all sorts of predicaments. One, having slipped into the house during the evening, went on a tour of inspection, and, tipping the grating on top of an unlighted oil stove, tumbled into the closed compartment below. Putting a small bench in front of the stove we lowered the door that conceals the burners and a grateful young Algy

walked out and scampered for the open door. Another time, when one got into the house, he slipped under a studio couch and climbed into the bedding tray. We could hear his little feet patter on the heavy paper lining long before we guessed where he was. Of course he could not find his way out and there were a few tense moments while the tray was pulled forward and the youngster returned to his anxious parents.

My husband has come to accept them as part of my menagerie, and is increasingly amazed that we can walk through a veritable army of the most feared little animals on earth just by calling the absurd name of "Algy" as we approach. Pat, our Llewellyn setter, disdainfully ignores them; Tidy and Tam, the cats, leave them strictly alone; Blondie, the kitten, and the younger Algies now share their meals, although with much caution on the part of both.

Our experiences have brought us to believe that man is more responsible for the skunks' reputation than is the animal itself. Certainly one could not ask for a more gentlemanly skunk than Algernon has proved himself to be, nor has any one of his flock committed a breach of manners unbecoming a guest—such are the family traits.

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Goldthread on the Forest Floor

By WARREN C. WILSON

FROM Labrador to Alaska, south to Michigan and in the mountains to Tennessee, the tiny goldthread forms a miniature carpet in cool, damp forests. Its three-parted, blunt leaves often cover mossy logs and stumps with a shining, deep-green mantle. In May attractive white flowers rise on slender four-inch stems above these evergreen leaves.

In the acid humus or black organic soil under the mats thread-like yellow roots run in all directions. They are bitter to the taste and possess medicinal properties. A yellow dye can be made from them. New shoots are produced by them at intervals, and a plant in a favorable location soon spreads to form a solid carpet of some size.

Botanists agree that the goldthread belongs to the buttercup family and the genus *Coptis,* and the species of the far North, including Greenland and Eurasia, is usually called *C. trifolia.* Some botanists, however, prefer the name *C. groenlandica.* In any case, goldthread is a charming plant and well worth using in a wild flower garden. It will grow well if given light shade, with ample moisture and an acid, organic soil. Its beauty will repay this attention.

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December's First Snow

By U. C. DEIKE

The clean sweet fields of early spring
That skirt this little town
Gave place beneath the summer suns
To shades of russet brown.

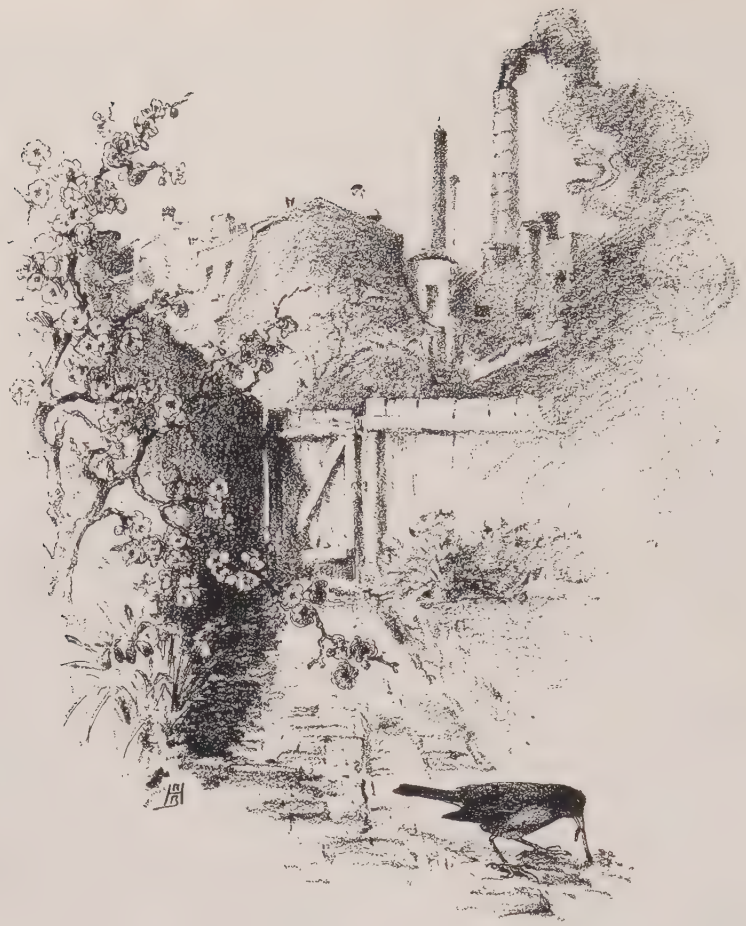
Then in November's searching breeze
Leaves raced across the plains,
And naked trees came into view
Through chill autumnal rains.

Last night it snowed and each small field
Was covered when I woke
As if King Boreas had spread
His mink-trimmed ermine cloak.

'Tis wonderful! And beautiful—
This change to virgin white—
Yet greening grass, and budding trees
Give men the most delight.

Grim winter months drag slowly by,
But summer slips away
As if to warn that happiness
Has little time to stay.

The blue birds, and the meadowlarks
Will find a welcome when
Their cheerful notes once more are heard
From yonder snow-clad glen!



In a City Dooryard

By GRACE V SHARRITT

MY DOORYARD is a small back lot fenced between other similar plots in a large metropolitan city. Although factory smoke curls toward my garden, the air of spring smells sweet of almond that flowers along the walk. The sky, frescoed with wires of telephone and chimney tops, is blue and starlit and occasionally a wing of a wild bird can be seen silhouetted against the city moon. Crickets scrape their musical wings in the grass to the distant accompaniment of industry's cymbals, the city noises seeming to heighten the soft chant of well-being in my yard.

Here is where I go when I need reassurance that civilization is not doomed. Here is where I found soul refreshment and a renewal of faith in the rightness of the primordial planning of the universe. Here is where I have discovered a curious feeling of belonging to this small length of green grass, bordered with primroses and lilies. Earth of earth.

The morning I planted seeds of the larkspur I watched an earthworm burrow in the soil. This seemingly headless, hindless creature pushed his body in and out, under and up, through the warm, porous earth, like a brown pliant needle weaving a definite pattern in the soil. Tiny cracks and crumbles appeared in the square-inch of loam. Minute piles of rich dirt crusted the surface.

"To what purpose?" I asked myself. Here was an infinitesimal unit of Nature working, grubbing, carrying out its life's destiny according to plan. Regardless of world-wide controversies, of war, the burrower cultivated and aerated the soil for life; and towards death. In due course of time, flowers would appear with pollen-dust for bees and nectar for hummingbirds. These plants, in their place, would fulfill a need for loveliness and green vegetation in a city of steel and cement.

Here was a world in miniature portrayed on a grassy canvas; an isolated world, without any human interference to upset the sensitive balance of Nature's creatures.

The morning dew was still wet on the grass. Glistening drops lay like crystal beads on a broad-tipped lily leaf that half concealed the fragment of earth where worked the earthworm. A robin flew to the fence-post, then to the ground nearby. He cocked one eye at me and took a hop. Tilting his head sideways and measuring me warily, he ran his funny turkey-trot a few steps nearer. Then he edged towards the lily leaf. The earthworm wriggled a sinuous turn into the dirt. The robin's bright eye caught the movement. His beak did the rest. In giving its body as a source of living food to a bird that would rid my garden of insect parasites, the earthworm had performed its supreme sacrifice.

There was no sense of futility. Rather, I felt an upward surge; a deep satisfaction that Nature's inexorable law of supply and demand had been obeyed. The earthworm's humble but glorious work had now been completed.

There was a barren place in the rear of the dooryard where no living green thing would grow. Hollyhock plants took feeble root, only to wither and die. Sunflower

seedlings molded in the dank earth. One summer day, as the western sun brushed the evening clouds with tawny pink, I saw the rat who sped to that corner of the garden. There, I discovered, under shadow of the walk, was his den.

"So," I thought, "there is some form of life in that spot. Low it may be, but life it is, and there for some purpose; either to prove that beauty is not without ugliness, or that security is never safe from dangerous forces."

From my place in the tiny arbor I could watch the rat. He slunk from his hole, scurried under the shrubbery, then returned to his den again carrying some food morsel with him. This performance he had repeated three times when I spied a lurking gray-striped cat. The big tom, crouched beneath the protecting foliage of a rambler vine, bided his time as the shadows of dusk lengthened in the garden. I, too, kept vigil.

An errant breeze, delicate with rose fragrance, drifted through the tiny yard—symbol of sweetness and light. A breath of chill acrid air suddenly lifted the dust near the walk, as a crouching form sprang towards a furtive shadow—a symbol of sinister darkness in such a place.

In the skirmish, the rat fought viciously to stave off death. But the cat, arch enemy of the rodent, claimed victory.

Again death had come to my dooryard. But death charged with fear and hatred. Towards this epic of the inexorable law of the survival of the fittest there was a feeling of horror—of ruthlessness.

There will be no proud memorial to the rat's labor in my garden, as there is of the earthworm's. However, there will be an ever-zealous watch to improve and rout the enemy in that corner of the dooryard. An ever-present reminder that to have a place in the eyes of a peaceful sun, one must prepare, must 'tend and guard against evils that slink within.

Fear acts as a checkmate to contentment. But contentment needs the reminder of occasional danger to sharpen her frail beauty.

The leaves of the almond shrub flutter to the ground in the November rain. The branches are now quite bare. Not as of death, but only waiting for spring's resurrection.

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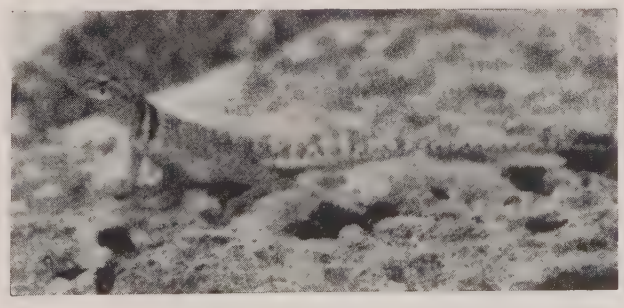
The Collared Lizard of the Ozarks

By GEORGE E. MOORE

EXOTIC in appearance, and remindful of some miniature pre-historic reptile, is the collared lizard of the Ozark region. Here, near the northeastern limit of its range it is found only where outcropping limestone ledges hold back the encroachments of vegetation and furnish suitable habitat for this desert species, in a few of the glades.



Only color film or the brush of an artist can depict adequately the colors of the males—bright green with yellow bars, orange throat and a double band of jet black across the back of the neck. Sunning on hot days, they often hold open their wide mouths showing a strawberry-like interior, which adds to the color effect. They have the chameleon-like habit of changing color. One, which we knew as "Stumpy" from an abbreviated caudal appendage, would emerge from the darkness of his rocky retreat a muddy-brown color with only a tinge of green along the sides. After basking in the sun for fifteen minutes he would appear quite brilliant. Other individuals, which we have assumed were females, showed no green, being brown with yellow bars.

When outside their retreats, they spend most of their time sunning on the rocks. On very hot days, when the sun is high, they retire to their rocky fastnesses, but may often be enticed forth to investigate a disturbing sound. Their heavy, ungainly appearance is belied by alert, quick movements. Although wary and suspicious, if stalked carefully they may be approached to within arm's length. Before retreating they often alternately raise and lower their bodies and swell, as though to show fight. They run rapidly on all fours, or, when caught away from the ledges and hard pressed, they travel frog-like, in tremendous leaps, made possible by long and strong hind legs. One, snapped at close range, became startled, leaped into the crouching photographer's lap and disappeared, leaving for a moment some panic-stricken questioning as to its whereabouts.

Although we have slept in the glades several times to watch them we have seen no evidence of nocturnal movements, and they did not appear until the sun was high enough to dry the dew. In captivity they are easily handled, but when aroused can fight. A friend who kept one in an enclosure with several snakes, found it more than a match for any of them. Natives of the region call these lizards "mountain boomers", and many of them are quite sure that the creatures are deadly "pizen".

Miniature Landscapes

By ISRAEL NEWMAN

THE tiny landscapes pictured here represent many pleasant hours spent in the woods, by stony brooks, in gravel pits and on the seashore. In such places mosses and lichens, or pebbles and fragments of rock of various colors, are plentiful. Those hours outdoors were rendered especially pleasant by their purposiveness and by the exploration they involved. It is always good to have something to look for. The hours at home spent in putting together the collected mosses and lichens into complete landscapes, a few inches in diameter, were as interesting as those spent in collecting the material.

It may be that there is in everyone an inherent love for objects found in Nature, a love that crops up at the first handling of such objects. And there is no love of any sort that does not add to the worth-whileness of being alive.

In my rambles I had often observed how some patches of moss resembled rolling country, and how some stone-fragments resembled mountains and cliffs. One discovery was that deer-moss resembled actual trees, and shortly after this I came across a manuscript by a to-become-famous poet who described a patch of deer-moss as a "miniature petrified forest".

Deer-moss is found in patches on pastures and here and there in the woods. There are many varieties of these tree-like plants. Most of them have a rather coarse texture although some are fine. The latter variety—harder to find—gives the best results. It is best to select the "trees" when already dry—so they will not change later. When gathered damp they may be packed together in a paper bag, or other container. If they dry in this packed condition, immersion in water will restore them to their original forms.

The green mosses, used to imitate grass, vary a good deal in color and texture. The same variety of moss may be short napped and of a fine grain when young, but coarse and curly when mature. The best moss is found at the bottom of the tree trunks in the woods. It is easily removed from the tree trunk by means of a knife, which also takes a thin layer of the bark. Before gluing it to your landscape, shave the moss off with a razor blade. You will thus obtain as thin a layer as desired. Moss loses some of its color when washed. If it has to be washed, dry it before you put it on. Your landscape will look more natural if you will cover it with patches of moss differing in shade and texture.

Lichens (Continued on page 47)

The Mystery of the European Cuckoo

By HENRY WILLIAMSON

Illustrated by R. Bruce Horsfall

"THE BIRD SETTLED ON THE BRANCH OF AN ELM ACROSS THE LANE, ABOUT EIGHT FEET FROM ME. IT HAD AN EGG IN ITS BEAK. . . . THE CUCKOO WAS TRYING TO SWALLOW THE EGG WHOLE, WITHOUT BREAKING THE SHELL."

FOR MORE than a quarter of a century I have waited to solve for myself the mystery of the cuckoo laying or not laying—its egg in another bird's nest.

Does it lay its egg on the ground and carry it in its bill to the selected nest of robin, pipit, wagtail, or hedge-sparrow, or what?

There has been shown a film of a cuckoo at another bird's nest. I have not seen it, but I am told there are, despite the film, two schools of thought or observation. One says the cuckoo lays and carries its egg; the other says it simply lays in the other bird's nest.

Not long ago in a Surrey lane I saw something for myself that settled the question, at least in my own mind, and which nicely complemented a boyhood observation.

One May day in 1912, in a Kentish woodland, I was walking past a faggotstack when I noticed a gray bird sitting awkwardly on a nest at the edge of one faggot. With a shock and fast-beating heart, I knew it was a cuckoo. I "froze" in the approved Indian manner, and remained thus, feeling myself to be swaying obviously, for more than five minutes. Then the bird flew away, uttering a throaty, gabbling sound.

It was a hen cuckoo, and it had just laid a gray, thick-shelled egg (as I found out when later I tried to make two holes in it for blowing) among three blue hedgesparrow's eggs.

Actually, before the egg was blown, I put it back in the nest and went away, and came back, pretending to discover it, to relive the marvelous moment. At last I had found a cuckoo's egg! It was one of the great occasions of life. When one looks back on the years, how such occasions stand out!

The keeper in those woods told me that he had shot, years before, a cuckoo with an egg in her beak. He said a cuckoo laid an egg on the ground, then flew and dropped it in the foster-mother's nest. Others told the same story.

People to whom I told what I had seen invariably said it was a common fallacy that "the cuckoo lays its egg in another bird's nest." But I had watched it laying its egg; at any rate, sitting there as though it were.

In August, when the old cuckoos had flown away to Africa again, I saw several young cuckoos, reddish-brown in plumage where the matured birds were slate-gray, flying about the woods and along the hedges.

It seemed that any small birds fed them. I watched one being fed by a wagtail, then by a chaffinch, then a robin. The cuckoo uttered a peevish, whining sort of cry. Hearing this, small birds round about seemed to get agitated, and flew to it. It sat there, opened its beak, and just swallowed what was given to it.

Once it seemed to be swallowing the wagtail, for it shut its beak while the wagtail's black-and-white head was down its throat. The wagtail looked quite dishevelled when it reappeared.

Two years after, in 1914, I was out in the fields and woods every spare moment I had. I found a night-jar's nest in June; my last nest that year. Two months later I was one among many dust-clogged striplings marching to Aldershot and Crowborough Camp. And, although during the next four years I found nests of magpies, buntings,

". . . I NOTICED A GRAY BIRD SITTING AWKWARDLY ON A NEST AT THE EDGE OF ONE FAGGOT."

and even an owl in the broken woods and sunken lanes of Picardy and Artois, the feeling of oneness, the unconscious flow of life from the countryside, was broken for me, never to return, except in memory.

The above is recalled by what I saw not long ago when walking along a lane between Chertsey and Chobham, in Surrey. Passing a red-bricked manor, at the end of the wall by a summer-house with roses climbing over its half ruined heather-thatch, I saw a cuckoo fly out.

The bird settled on the branch of an elm across the lane, about eight feet from me. It had an egg in its beak. A wagtail was behaving curiously, as though much perturbed by a strange feeling of fascination, on the road below.

It knew the cuckoo was there, and skipped about as though half-miserable, half-pleased. Yet the wagtail had seen the cuckoo take one of its eggs.

Now the strange thing was that the cuckoo was not sucking the egg, as a jay or crow will suck an egg it has filched for a meal. The cuckoo was trying to swallow the egg whole, without breaking the shell.

I saw it clearly. I watched its efforts to shift the egg about, to fit it to the gape; the gentlest efforts. For about a minute it tried, then the egg slowly disappeared, and a lump appeared in the bird's throat. Even so, it swallowed with the greatest delicacy.

What strange transmutation of life was occurring in the unseen world, from which life springs, from which that act was instinctively directed? It was as though the wagtail were sharing a mystic rite.

Did she know, dimly and intuitively, that she had been selected to rear a strange nestling that would throw out her own young, which, falling below, would be allowed to die, without the least effort on the part of the parents, while a monstrous interloper trod and pushed the nest all shapes in its demands for food, more food, all the food; and that she and her mate would work themselves thin and scatty for it.

Something went wrong in that unseen world, I guess. The maternal instinct of the cuckoo species somehow got entangled with that of certain other species.

Thus the cuckoo is condemned, by a flaw in the natural law, to reproduce itself without the satisfactions of nest-building and brooding; and to adjust this flaw Nature put a nerve in the hollow of the nestling cuckoo's back, so that it had to throw off anything that touched it.

And as nestlings sleep warm on one another, those nestlings had no rest—nor did the young cuckoo—until they were out and over the edge.

For myself, I am satisfied. After twenty-seven years I have concluded the cuckoo query within myself. After removing an egg in its bill from another bird's nest, it leaves one of its own. Then, as the poet said, "Loude singe cukko."

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The Burden Of Beauty

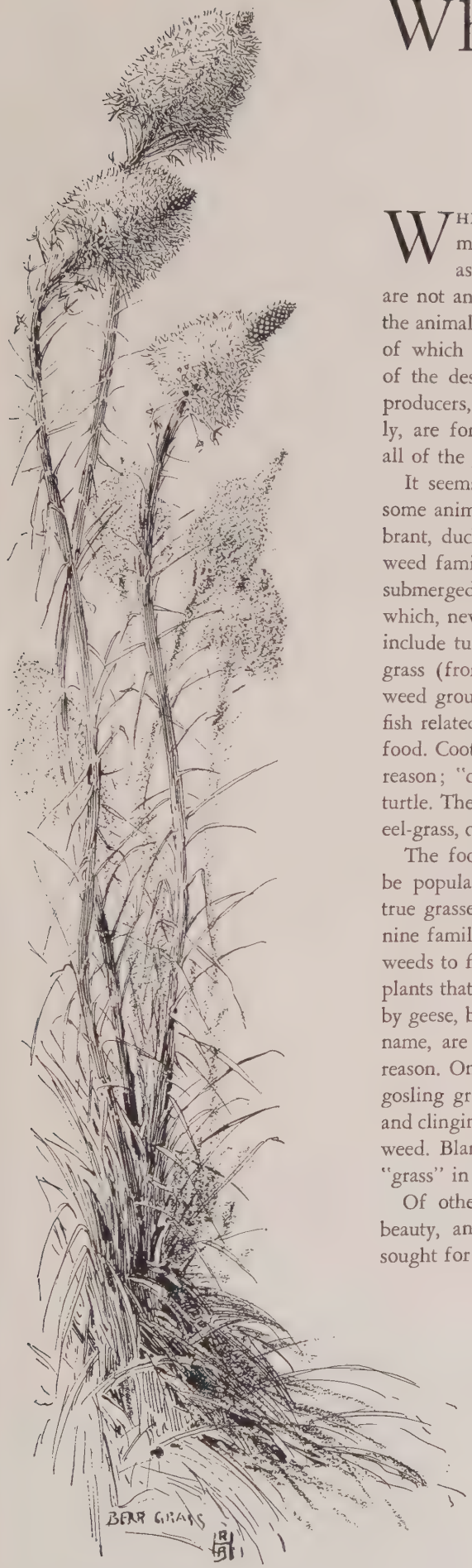
By PAULINE DILLINGHAM

A huge and stately oak tree,
Through rolling years defied
Wild winds and ruthless lightning,
Unbending in its pride.

Until, with breath congealing,
An icy storm rushed forth
In pure and frosty splendor,
From out the frozen North.

It sheathed the oak in gleaming
Pale crystal, coldly bright;
Shot through with rose and azure
And dazzling glints of light.

And lo! the tree's great branches
Crashed earthward, rent and torn,
Beneath the weight of beauty,
Too heavy to be borne.



When A Grass Is Not A Grass

By W. L. McATEE

WHEN the prophet said "All flesh is grass," he must have had in mind more than is comprised in the plant group correctly known as grasses. For one thing he lived in an arid country where grasses are not an abundant, year-long feature of the landscape, and, for another, the animals with which he was best acquainted were goats and camels, both of which feed freely upon shrubs, including the tough, thorny growths of the desert. In more humid countries, also, the ruminants, prime flesh producers, by no means restrict themselves to grasses for food. Deer, especially, are fond of the edible parts of woody plants or browse, and almost all of the grazers, or grass-eaters, are to some extent browsers.

It seems, however, that the very fact that a plant is used as food for some animal tends to make it a grass in popular nomenclature. Hence the brant, duck, manatee, puldoo, redhead, and widgeon grasses of the pondweed family, underwater plants that are very little like real grasses. Other submerged growths of equally indefinite resemblance to true grasses but which, nevertheless, bear the name in connection with that of some animal, include turtle-grass and canvasback grass of the wild-celery family, skunk grass (from its smell) among the algae, and buffalo grass of the pickerelweed group. This buffalo is not what you might at first think, but a large fish related to the carp, and it uses the "grass" for shelter rather than for food. Cooter grass of the watershield family may be so-named for a similar reason; "cooter" is the southeastern word for the fresh-water terrapin or turtle. The water crowfoot of the buttercup alliance, sometimes called green eel-grass, can hardly be of any use to eels except as cover.

The food motif is important, however, and in this connection it must be popularly believed that geese eat almost anything, for besides some true grasses dedicated to them there are goose "grasses" in no fewer than nine families of American plants. These range from horse-tails and arrowweeds to five-fingers and mullein, including at least four species of sedges—plants that really do resemble grasses. Doubtless all of these herbs are eaten by geese, but two others remote from the grass alliance, though sharing the name, are associated with these birds for a different and very interesting reason. One of them is called not only goose-grass but, with more reason, gosling grass, because these youngsters get entangled in its prickly-angled and clinging stems. For the same reason it is named turkey-grass and chickenweed. Blamable also from the standpoint of the poultry raiser is a goose "grass" in the forget-me-not family and it is significantly called catchweed.

Of other mock "grasses" named for animals, deer grass, a meadow-beauty, and elk grass, a sedge, get these appellations because they are sought for food by their animal namesakes. Bear grasses of the yucca group, however, seem to be so-called because they look somewhat like grasses and are big. Alligator-grass, a rapidly growing herb of muddy southern shores, is thus denominated merely because alligators lie in it.

From the nature of their tops, certain false grasses are described in popular nomenclature as cotton- and wool-, bayonet- and spear-grasses—these are all members of the sedge alliance. Others are saw-, sickle-, and cut-grasses because of their damaging effects on clothing and skin. Poverty grasses all seem to be species that grow on land that is poor for crops but is good for (Continued on page 47)

Food of the Gods

By EDITH M. LAING

SPICED with romance is the luscious chocolate pie and fragrant cup of cocoa, both of which we enjoy as a matter of course. What is the delectable ingredient responsible? Whence does it come? What sorcery converts it from forest fruit to magic powder?

According to Prescott, the historian, Montezuma, Emperor of Mexico, was extremely fond of a rich beverage named *chocolatl*. Flavored with spice and vanilla, it was whipped "to a froth of the consistency of honey", served in golden goblets, and "melted in the mouth". Cortez learned that this was prepared from the fruit of the *cacahoatl*, a native tree cultivated by the Aztecs. The Spaniards, who simplified the name to cacao, saw the beans for sale in the market and also being used as a medium of exchange.

The conquerors of Mexico introduced this tropical delicacy to Spain. In spite of Spanish efforts to guard the process of extracting the *chocolatl* from the bean, the secret spread to rivals, and by the 17th century chocolate houses were the rage in England and Germany.

This tropical American tree whose botanical name, *Theobroma*, comes from the Greek and means "food of the gods", has been introduced with marked success to the East Indies, Samoa, and the African Gold Coast. With spreading habits, dense foliage, and small yellowish flowers, the cacao grows from twenty to thirty feet high, and bears for some forty years.

Long, melon-shaped fruit pods, like the one here pictured on a Costa Rican stamp, are borne on both trunk and old branches, preferably where there is little foliage, and ripen all year round. The thick, tough, yellowish rind contains twenty to forty beans embedded in a moist white pulp. These beans resemble large, shelled almonds.

Natives with sharp knives on long poles harvest the pods, and the pulp is scooped out and spread on banana leaves, or coconut matting, in the sun. During the fermentation process that results, the pulp disappears and the beans take on a brownish hue. The beans are then dried and shipped to the world markets.

Of the whole world crop, the United States consumes nearly one-half. In our great modern factories the raw beans are carefully cleaned, roasted, agitated and winnowed. By then this outer shell has been whisked off, and the bean fragments that remain are called nibs.

Frictional heat generated from the grinding and regrinding of these nibs liquefies the fat content, called cocoa butter, and results in a rich liquor which constitutes the base of all forms of chocolate. After further refinement this liquid mass is poured into molds to solidify into bars of pure chocolate.

To manufacture cocoa, the chocolate liquor is subjected to powerful hydraulic pressure until more than half of the cocoa-butter is squeezed out. The residue, now called cocoa, is then pulverized and air-sifted to a fine dry powder. And so to market.

The valuable cocoa-butter, which comprised fifty-four per cent of the cacao bean, is used mainly for candies and cosmetics. The empire of Montezuma has vanished, but the pleasing drink his people invented, and the more modern chocolate pie, still persist on menus of today.

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Jugs of Eumenes

By WILLIAM A. MATHENY

Quaint charms, are you but elfin urns for dreams?
Or do you store the fragrance lost by days,
That—beautifying—always flutter streams
Of perfume from coquettish perky ways?
Could you be tiny compacts of the rose,
Kept near to burnish faded petal tone?
You loiter near pale buds, lend twigs repose;
Your poise, in fact, would well become a throne.
You are, I think, the cups from which nymphs pour
Rare splendor tints, the glamour rouge, of leaves—
Their make-up—flared to honor summer more,
Since she must go; and going, gladly grieves.
No matter what you are, forget my plight!
You fill my heart with wonder, praise, delight.

UNDERWATER BUTTERFLIES

By WILLIAM AND EDNA EVANS

Photographs by the Authors

Autumn leaves are brilliant, birds are many-hued, but on fish life around the rocks and coral beds of the tropics Nature lavishes her most gaudy colors. Like flashing finny butterflies, they flit from coral head to sea fan as butterflies flit from flower to flower. While many of these tropical marine gems are often seen in aquariums, they are at their best in their native haunts.

Present in almost every rock heap and coral formation in shallow tropical American waters are the Beau Gregories, *Eupomacentrus leucostictus*. These little fish, rarely growing more than four inches long, are garbed in royal blue and gold. The blue covers their backs down to the lateral line, and the gold floods their lower parts. The Beau Gregory seems more to flit rather than to swim, and at the least sign of danger, these miniature gems flash into a hiding place. Each one has a certain nook that is exclusively his own. Let any other creature approach and the tiny fellow will sally forth, fins spread, to fight for his domain.

The butterflyfish, *Chaetodon*, has a disposition as

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Above is the French Angelfish, a striking fellow with a glossy black ground color and with each scale edged with yellow. Below is the Ribbonfish, which has a ground color of silvery gray lined with seven narrow black bands running horizontally from head to tail. It suggests an underwater zebra, and its high dorsal fin adds to its bizarre appearance.

The Cowfish, which gets its name from its rather bovine appearance when viewed head on, is encased in a hard shell. It is most common in southern waters.

dainty as its name. Its ground color is pale yellow crossed by thin, slanting black lines converging at the lateral line, with a thick, black bar running vertically through the eye. One species, the four-eyed butterflyfish, *Chaetodon capistratus*, has a round, black circle bordered with white at the base of the tail, giving rise to the popular name. Butterflyfish feed on any minute bits of animal life they may find in cracks of the coral.

Butterflyfish are often found in the same general locality as parrotfish, which are so named because of their fused teeth, which suggest the bill of a parrot. Parrotfish are mainly vegetarian, scraping bits of algae and coral from the rocks with their small but powerful beaks. During the process many bits of animal matter become lodged in the cracks of the fish's beak. The butterflyfish plays the role of dentist, literally picking the teeth of the parrotfish. The parrotfish, apparently realizing the benefits derived from the performance, obligingly opens its mouth and even treads water straight up and down while the butterflyfish is at work. Butterflyfish may also often pick parasites from the bodies of other fishes they may be associated with.

Among the tropical marine fishes equipped by Nature with movable spines are the trigger fishes and the file fishes. These spines are located far enough forward to discourage any attempt to swallow the fish head first.

File fish have only one spine, while trigger fish have two, and, in some species, three. With both groups the spines are movable and fit into a groove on the animal's back when at rest. They replace, and are in the same position as, the first dorsal fin on most fish.

Top prize for coloration among the trigger fishes goes to the queen trigger fish, *Balistes vetula*. The various shades of color on this fish defy description. The fins are usually deep blue, the area above the lateral line a shade of green, the belly pink or red, the breast more orange. Radiating from the eyes and along the fish's cheeks are deep blue lines.

When erected, the trigger fish's spines are locked into position, but they may be instantly depressed by pressing the third or smallest spine. This apparently suggested to someone the action of the trigger of a gun and resulted in the fish's common name.

Through every rock or coral formation move fishes with no apparent means of protection yet they flaunt some of the most bizarre colors that can possibly be found—even among fish. These are the angelfishes. This is a group of fishes generally heavy-

The Four-eyed Butterfly fish feeds by picking minute bits of life from the coral. It does not have four eyes but derives its name from the marking on the tail

bodied, common in the West Indies and in rocky spots throughout tropical American waters. They are not related to the fresh water angelfishes sold by dealers in small tropical fish.

The black angelfish, *Pomacanthus arcuatus*, is the commonest of this group in south Florida waters, and its range extends southward into the West Indies. The black angelfish is truly black, this tint even extending to the fins and tail. Only the inside surfaces of the pectoral fins are yellow, and when they are folded against the body their color is not visible.

Another species almost all black is the French angelfish, *Pomacanthus paru*. This fish is glossier black and each scale is edged with bright yellow. The young of both black and French angelfishes have light yellow cross-bands. As the young fish grows these gradually fade and are replaced by the adult coloration.

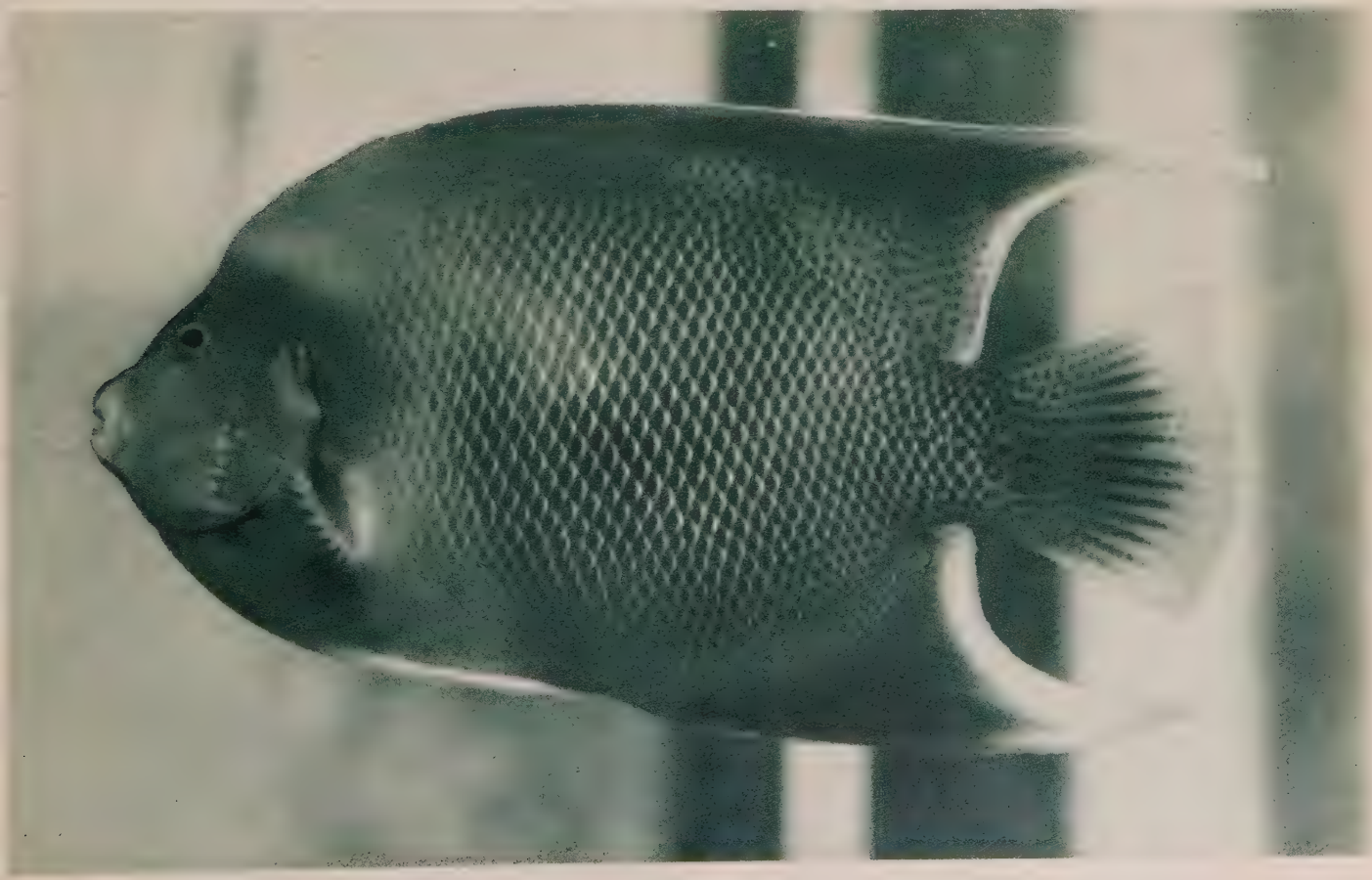
The blue angelfish, *Angelichthys ciliaris*, and the queen angelfish, *Angelichthys isabelita*, are both gorgeous with predominating colors of golden yellow and bright blue. The edge of the tail fin, ventral fins and edges of the pectorals are bright yellow. The anal fin is edged in blue. Spines on the dorsal are also blue. Other shades, including a bluish-green, play over the fish's body.

Predominating differences between the two species are the queen angelfish's entirely yellow tail, and the royal diadem of yellow and blue in front of the dorsal fin.

All the angelfishes, in fact most reef fish, have comparatively tiny mouths. However, their teeth are extremely hard and well able to delve into tight places in search of food. The angelfishes are all fairly large fish as reef fish go. The average length is perhaps around a foot.

Adding a bit of contrast to the tropical reef picture is the ribbonfish, *Pareques acuminatus*. With a ground

The File Fish above is equipped with effective spines, and in the picture has its file erected ready for trouble. The Blue Angelfish, below, is truly a gorgeous underwater butterfly with predominating colors of golden yellow and bright blue.



The young of both Black and French Angelfish have pale yellow cross bars but these fade and the fishes take on the adult coloring. Garbed in royal blue and gold, the Beau Gregory is found in almost any rock or coral group in shallow water. The Queen Angelfish, below, is notable for its entirely yellow tail and for the royal diadem of yellow and blue in front of the dorsal fin.

color of silvery gray and with seven narrow black bands running horizontally from head to tail, the ribbonfish suggests an underwater zebra. The extremely high, first dorsal fin lends just the necessary bizarre touch to make this a true tropical reef fish.

Although the cowfish, *Acanthostracion quadricornis*, can hardly be called a tropical fish, for its range extends northward on the Atlantic coast as far as the Carolinas, it is most common in the southern part of its habitat. Its body is inclosed in a hard shell, somewhat like a crab. From this shell, the fins project like the oars of an ancient galley. These fishes have tiny mouths, and immediately above their eyes are two horn-like projections, which, when viewed from in front, give a decided bovine cast to the cowfish countenance.

Sharks rarely pay more than passing visits to coral reefs. There are too many hiding places for smaller fish to make good hunting for any hungry shark. Of course, should a visiting shark find an injured fish, it would not hesitate to snap up the tasty morsel.

"Boots" and "Jimmie" discuss the matter of raising a family, the latter, on the right, apparently being quite emphatic in his ideas. We wish that we could understand canary language.

"BOOTS" AND "JIMMIE"

An intimate glimpse at the family life of a canary pair

By R. J. HASSMAN

"Jimmie" is not a pure bred canary, but, like many dogs of uncertain ancestry, he seems to have a special personality and individuality. His coat is more green than yellow, but his song does not appear to have suffered for lack of notable canary lineage. He sings with verve and tone, and with evident enjoyment of his own concert. He is, also, quite a clown, given now and then to a playful pull at "Boots' " tail feathers, a gesture that often precipitates a tussle.

"Boots", however, is a genuine roller canary with green markings. Although female canaries are not usually noted for their vocal abilities, she sings well, although not with the quality of her mate.

Particularly tame, this couple are a constant source of amusement, and, often, of surprise. They talk with us, begging to be played with, to be given a bath, or to have the privilege of certain food delicacies. They tell what they wish with peeps that have special tones, and by twitterings, the emphasis telling those who know the canary language what is on the birds' minds.

Canaries, of course, belong to the finch family. They mate from February to July, and during this time the female will nest two or three times. Each time she lays four or five eggs, which hatch after thirteen to fifteen days. During this time the male usually feeds his mate. Special food is given the birds during the mating season, and when the young birds appear, and the yolk of a boiled egg is part of the proper diet.

The young canaries are blind for the first week, but after three weeks they are able to get out of the nest and attempt to feed themselves. Young males try out their voices when about one month old. If the birds are to be tame they should be handled when growing up in the nest. Canaries catch cold easily and must never be left in a draft, although they can stand extreme heat and cold.

"Jimmie" and "Boots" have been in Yellowstone Park at an elevation of 9000 feet when several feet of snow was on the ground, and in Death Valley, where it is 280 feet below sea level and the thermometer was at 115°. They raised their family immediately after that trip.

"Boots" gets busy preparing the nest, while "Jimmie" looks on with what is quite plainly a critical air. He sounds as though he were giving his lady plenty of advice on nest construction.

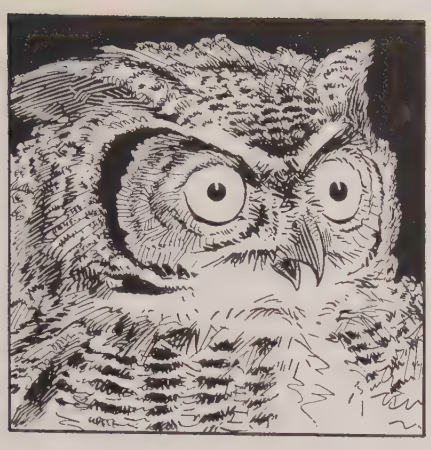
Oh! Oh! "Boots" has had about enough of this free advice and talks back. Her tail feathers moved so rapidly in emphasizing what she had to say that the camera could not stop them.

My! My! Can this be discord in the canary cage? "Boots" appears to be following up her pointed remarks to "Jimmie" with actions that leave no doubt as to her sentiments in the matter.

All is now tranquil and the eggs are in the nest. "Boots" settles down to the serious business of brooding the eggs, which will require her attention for from thirteen to fifteen days.

The youngsters are two days old and still blind. The mother feeds them with a special diet that is provided for her during the mating season and while she is caring for the young.

Now the youngsters are twenty-one days old, and big and strong enough to get out of the nest. However, "Boots" will continue to feed them for about another week.

As We  See It

OPTICS AND DEFENSE ★

Tanks, great bombing planes, artillery and other items of modern warfare are spectacular in character and in the details of their production. Yet most of them would be useless without the adjuncts of precision instruments, in which optics and optical glass are a vital part. Production of such instruments is highly technical and complicated; unspectacular and thus no lure to the newsreel photographer. Hence the public is utterly ignorant of the details of this essential war industry. Equally ignorant in this respect is most of the press of the country, which has recently gaily indulged in compounding an injustice, and actually, for a time, endangering defense preparations.

We refer to the recent indictment of the Bausch and Lomb Optical Company on charges of violation of the anti-trust laws, and the subsequent trial of the case in the newspapers—and nowhere else—by news writers, special writers, headline writers, columnists and other "authorities". Unhampered by facts, they sat as judge and jury over an industrial concern whose contributions to the defense of our country in the past and in the present emergency yield to no other industry. The journalistic verdict was a brew of ignorance, untruths, half-truths and the lure of scare headlines. There was no verdict of the court. Agreement was reached, without admission of guilt, and a fine was paid in order that the plant expansion of Bausch and Lomb could be undertaken without delay, and the program worked out in cooperation with our Army and Navy could be pushed to meet the vital need of the nation.

It is interesting to note that the hysterical ignorance of the newspaper attack was based upon nothing more substantial than that Henry Lomb and John Jacob Bausch came to this country, in 1848 and 1849, from Germany. They sought freedom of mind and body in the new land. Despite the facts that Henry Lomb served as a captain in the 13th Regiment of the New York Volunteers in the War between the States, that Bausch and Lomb supplied the bore sight telescopes that made the United States Navy far superior to the Spanish fleets in 1898, and that the contributions of this company to the success of the Allied cause in World War I were outstanding, the newspapers shouted "fifth column", "Nazi domination", and other epithets. They ignored the record, scoffed at the facts and accepted the instance of an anti-trust suit of definitely debatable and highly technical justification as reason for a lot of inflammatory stories.

Actually, by the development of an optical glass industry in this country, and by arrangements that secured rights to German developments in this field, Bausch and Lomb has been of incalculable service to the country. Its advertisement, appearing in the pages of this magazine, has nothing to do with these editorial remarks. No comment was asked of us, and, indeed, Bausch and Lomb may prefer that nothing more be said about the matter. Nevertheless, Nature Magazine and its readers are just as vitally interested in the success of our defense program—and in justice—as anyone else. So we consulted the record and found the facts. A simple statement of these facts, and the fascinating history of the company, is to be found in a booklet entitled *Bausch and Lomb and Our National Defense.* Anyone who has any doubt of the loyalty and the service of this company would, undoubtedly, be welcome to a copy of this interesting publication and could obtain it by writing to the Bausch and Lomb Optical Company, Rochester, New York.

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SHOOTING BY BOYS ★

From bird's-nesting and the use of slings, flips, and pea shooters boys have gone on to the more dangerous and potentially very destructive air guns and small calibre rifles. These are the despair of suburban dwellers who see their pet robins, wood thrushes, and other birds killed before their very eyes, and they tempt the boys to try all targets, even up to the size of the osprey or fishhawk, one of which was killed in Washington for an eagle—as if an eagle were a legitimate victim. They are involved also in many accidental woundings and even killings of boys, other children, and sometimes of adults. In one institution are 300 children blinded by play guns. More than a billion rounds of .22 calibre ammunition have been sold in this country in a year and a single factory has turned out in the same period

in excess of 150,000 of the rifles. These are carried at any season and their use may involve violation of numerous laws and regulations. The offenses usually are undetected by any officer, however, and the offenders, if caught, generally are excused on account of their youth. This granting of exceptional status before the law should be accompanied by treating them as youths in other respects, and in particular denying them the privilege of owning or bearing arms. The judgment that should be a prerequisite to use of a deadly weapon can be acquired only with age and boys do not have it. Most states sell hunting licenses to boys 16 years of age, but it would be an important step in conservation if all lethal weapons could be kept out of the hands of persons under the age of 21.

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PROTECT ★ ★ MORE SPECIES

Usually there is great furore over any suggestion to transfer a species to the "songbird" or non-game list, but such demonstrations might be tempered by realization that curtailment of the game list has happened over and over again and that we are now entirely reconciled to the older instances. Our grandfathers shot as game: pigeon woodpeckers (flickers) and marsh quail (meadowlarks); our fathers, reedbirds (bobolinks) and bullbats (nighthawks). Yet there is hardly anyone today who would urge that such shooting be resumed. There was a time when pursuit of unusual game was advocated so that there would be something to shoot every month in the year. That idea, like many another of the "good old days", is now entirely dead.

The Migratory Bird Treaty Act of 1918 removed from the game list at one sweep almost all of the shorebirds, some thirty species the hunters had been accustomed to shoot. Yet there have been only minor murmurings about that action, because every informed person knows that with the greatly increased number of gunners, a single open season on shorebirds would result in virtual extermination of the numerous kinds that migrate chiefly in very narrow paths along the seacoast. Most shorebirds lay only four eggs and thus are lucky if they rear two young, they decoy in flocks readily and repeatedly, and are easily slaughtered. They are wholly unfitted to run a long gauntlet of guns, and if ever again forced to do so will place several more of their species among those gone forever.

We have changed, we have given up some forms of sport; why can we not without protest voluntarily, and as a result of forethought, abandon shooting practices that threaten the existence of certain still persecuted forms of wildlife?

Among birds of the United States, some urgently in need of greater, if not complete, protection are the sharp-tailed grouse, all of the prairie chickens, sage grouse, and all of the kites. Among mammals, the marten, fisher, wolverine, otter, grizzly bear, all seals and sea-lions, and mountain sheep are in such straits that no more of them should be killed.

Protection by an entirely closed season is something we can give easily and quickly and it should always be done before it is urgently needed; afterward may be too late. Wildlife should have the benefit of every doubt.

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CIVILIZATION AND WILDLIFE

A culture guided by conservation ethics will be a true civilization—one based on production, not exploitation. So far as his plant and animal needs are concerned, man can and should produce all that he consumes. He need place no reliance on the wild supply; in fact if he set out determinedly to utilize it, he could consume it in a little while. The use-from-necessity philosophy, with no present validity, should be considered buried in our past. Consumptive uses of wildlife now are for certain types of personal recreation and adornment—things monopolized by minorities, and which in the last analysis are not essential. Such uses should in no wise be permitted to exploit unduly, and certainly not to threaten to extirpate, wildlings that so well serve to adorn the whole land and to provide non-consumptive recreation for the multitude.

A civilization that prizes the natural beauties with which its home is endowed will allot areas for their preservation. It will not permit its populations to increase until every thing convertible into the requirements of human living shall be exhausted, and every useful or competitive wild creature is driven to extinction. It will practice self-control.

It will be self-reliant but will respect its neighbors. It will encourage honesty, tolerance, and kindness among its citizens. It will reverence ideals and be a mighty force for good. It will be a culture under which one would be understood who protects animals because he loves them.

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OUT WHERE THE VIEW BEGINS

By CY LANCE

Nature paints her picture
On canvas quite immense
Out there beyond the highway's edge,
Behind the billboard fence.

YOUNG ATTWATER PRAIRIE CHICKEN OF THE GULF COASTAL REGION

This youngster is a fine example of protective coloration. Photographed in its natural habitat on the prairies about eight miles north of Eagle Lake, Texas

DRUMS OF THE DYING

The story of the Attwater prairie chicken

By VALGENE W. LEHMANN

Photographs by E. P. Haddon, courtesy Texas Game, Fish and Oyster Commission

THE DEEP booming courtship calls of the Attwater prairie chicken once reverberated from the gulf coastal prairies with a force and monotony that pained some sensitive ears. But that was when the prairie extended almost unbroken from southwestern Texas near Port Isabel to western Louisiana near Bayou Teche, and the bluestem prairie grass grew three to five feet tall. It was before the time when man killed more game than he could eat, and raised more crops than he could consume or sell at a fair profit. It was before man pastured more livestock than the range could carry and drilled more oil wells than were necessary to supply his needs. In other words, the heyday of the Attwater prairie chicken was before man exploited the range.

Today the Attwater prairie chicken is on the verge of extinction. In Louisiana the birds are practically gone. Approximately 8000 remain in a few widely-scattered spots in Texas. More than 93 percent of their former range has already been depleted, and rice tractors and other mechanized implements are rapidly and systematically destroying the relatively small amount of favorable territory that remains. The booms of the Attwater prairie chicken, drums of the prairie, are becoming increasingly faint—drums of the dying they seem to be. Drums of the dying they are, unless man acts quickly and forcefully in the prairie chicken's behalf.

With the State legislature setting general open seasons and general bag limits without regard to rainfall or other conditions, laws governing the taking of prairie chickens in Texas have always been terribly inadequate. It follows, then, that hunting under inadequate protective laws has speeded the decrease.

Other factors that now menace a dangerously low population are well known. Storms, drought, and hail are locally serious. Heavy rains, which inundate vast areas of the low, nearly flat gulf coastal prairie are especially harmful in spring, or, more specifically, in May, the peak of the nesting season. For a given locality, it appears that two years in five are favorable for reproduction, two are poor, and one is bad, because of the spotted character of local rains. The favorableness of the weather for nesting varies greatly in different parts of Texas, in different counties, and in different parts of the same county.

With the possible exceptions of Jefferson and Chambers counties, Texas, practically all of the coastal counties are excessively grazed. Prairie chickens can not thrive in overgrazed areas because food and cover are lacking. Primarily because of over-grazing, hundreds of thousands of acres of once open prairie are now covered by dense stands of mesquite, huisache, live oak, and other brush; the land is practically valueless to prairie chickens as well as to livestock. The price of beef, however, is temporarily high; more cattle than ever are being placed in many coastal pastures. Over-grazing promises to become even more detrimental to prairie chickens, forage, soils, water and other natural resources in coming years.

Most ranchmen still burn their pastures at least once every two years in spite of the fact that most agricultural

experts advise against the practice. Fires are usually set when the grass is dry and the wind is high; the resulting fast, hot fires generally remove all tall grass except that occurring in low damp spots. Prairie chickens, however, prefer tall dead grass for nesting. Unregulated fires prior to the laying season—about March 15—cause chickens to concentrate nests in small, low, unburned spots where they are especially vulnerable to flooding and destruction by natural enemies. Fires that occur from late in March through June destroy nests and young birds and prevent an increase that year. Prairie chickens will continue to be scarce as long as unregulated prairie fires are common.

Natural enemies of Attwater prairie chickens, including skunks, opossums, red wolves, house cats, stray dogs, snakes and hawks destroy some nests, young birds and adults. Results obtained during three years of study, however, indicate that predators are not limiting factors of importance except where cover is deficient as a result of overgrazing, over-burning, or other causes.

Oil development has extended to every county in the coastal section. Oil crews, frequently equipped with rifles and shotguns, have surveyed almost every acre of chicken range many times. Forests of oil derricks are as unsatisfactory for prairie chickens as are forests of oaks, pines and other trees.

MALE PRAIRIE CHICKEN STRUTTING
One of the endangered birds photographed on the booming grounds north of Eagle Lake, Texas

Drainage canals have in some instances improved the territory within a mile or so of their margins as chicken range, principally by providing a permanent water supply where it might otherwise be lacking in summer. On the other hand, drainage canals, and the numerous roads that bisect the prairie, have speeded up run off, in many instances contributing to erosion and a lowered water table. As one result many prairie ponds that once held water throughout the year, produced edible fish, and served as concentration areas for prairie chickens and other game, now dry up in summer and produce virtually nothing.

Pasture mowing, an attempt to reclaim pastures depleted by over-grazing, promotes a nearly pure stand of grass when carried out in certain areas under special conditions. The major winter food supply of Attwater prairie chickens, quail, and mourning doves, however, is produced by the very weeds that mowing destroys. Because food is lacking, many areas that have been mowed consistently are virtually biological deserts; they forecast a condition that may become general when additional tracts are mowed without adequate provision for game.

Agriculture, however, has been the most destructive agency of all. Approximately 2,000,000 acres of former prairie chicken range in coastal Texas was cultivated in 1936; additional millions of acres that lie fallow are also practically valueless to prairie chickens because fertility, vegetation and topography have been changed for the worse. Indications are that the prevailing low prices of cotton and corn, together with the government crop control program, have somewhat retarded the expansion of upland farming. Extension of rice fields into chicken territory, however, continues at an exceedingly rapid rate. Although the general public does not realize it, much of the best prairie chicken range was acquired, especially during depression times, by a few select individuals who possess franchises on river water, or who have other special privileges, to be converted into rice fields. Some of these men comply with the letter of the government crop reduction program by actually reducing the number of acres that they annually plant. By so doing, they reap rich government subsidies sometimes amounting to $50,000 or more each year. They evade the spirit of the government program, however, by "laying out" land that has previously been cultivated and raped and "putting in" additional thousands of acres of sod land—prairie chicken range. It is difficult to see how such tactics do much to reduce the accumulated rice surplus, for land that has previously been cultivated usually averages about twelve barrels of rice per acre. The yield of rice on sod land, on the other hand, frequently averages twenty-five or more barrels per acre. It appears that the general public, as well as the prairie chickens, are heavy losers, as long as this practice is tolerated.

It may still be possible to save the Attwater prairie chicken. A more enlightened and cooperative attitude on the part of landowners, sportsmen, and the general public would help greatly. Landowners, for example, can improve the value of their land for prairie chickens by grazing pastures moderately, completing spring burning prior to February 1, and leaving not less than forty per cent of the best drained land unburned. Mowing pastures no earlier than July 1 and leaving native cover on knolls, around ponds, and in flats, and allowing (Continued on page 47)

Conservation Comment

According to an inventory of the big-game population of the United States, conducted by the Fish and Wildlife Service of the Department of the Interior in cooperation with Federal, State and private agencies, there are "more than 5,800,000" big-game animals within our borders. Sixty per cent of them are estimated to be on State and private lands, the remainder on Federally-owned areas. Those enjoying complete protection from the hunter are within the borders of National Parks. Michigan is the leading big-game state, and the white-tailed deer is the most numerous animal, there being some 3,578,000 of them. The mule deer, numbering about 1,400,000, and the Columbian black-tailed deer, with a scattered population of 301,200, are the second and third most numerous species. Thus these three species of deer account for 5,279,200 of the total number of big-game animals. The inventory lists elk next, with 201,300; then prong-horned antelope with 164,900; black bear, 105,-100; peccary, 49,800; moose, 14,200; mountain goats, 14,150; Rocky Mountain bighorn sheep, 8300; desert bighorns, 5300. The buffalo, the only big-game animal in captivity, number 3300. The exotic European wild boar total about 1600, and the grizzly bear has been reduced to some 1100. The smallest population in the big-game inventory is that of the woodland caribou, of which there are fifteen in Minnesota. With 839,800 big-game animals (mostly white-tailed deer), Michigan is the leading state, while Delaware, with thirty white-tailed deer, brings up in 48th place.

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We were interested in a recent statement of policy by the Outdoor Advertising Association of America, Inc., carried in an advertisement in *Advertising Age*. This is a re-wording of earlier statements of policy, proclaimed but not widely observed during the past fifteen or twenty years. To anyone not acquainted with past performances, the declaration reads most glibly. The members of the Association are, according to the statement, pledged to erect and maintain advertising structures only when "consistent with established principles of safety, as defined by traffic and engineering authorities." This allows wide latitude, as the Association well knows, since, aside from close proximity to dangerous intersections, there is as yet no complete agreement among traffic and engineering authorities as to the safe proximity of billboards to curves, hilltops and such locations. Of course, the billboard industry vehemently denies that a roadside billboard could distract attention from driving, although it is placed by the road for that purpose.

The Association also agrees not to erect or maintain structures that would not recognize and respect the public interest in "natural scenic beauty; parks, parkways and their immediate approaches; historical monuments; shrines, and places. . . ." The industry reserves the right to arrive at its own conclusions as to what is scenically beautiful, and its decisions are too often colored by desire for a choice location.

Perhaps the most interesting affirmation in the statement is that the Association "will support the enactment of non-discriminatory legislation for the reasonable regulation of the use of land abutting public ways, providing such legislation has the support of a majority of the owners of property and business in the area to be regulated." The industry regards as discriminatory any proposal that does not recognize the billboard as an essential industry on a par with a filling station, eating place or any other roadside enterprise. The billboard, however, is not in the same category, and properly constructed and conducted enterprises need not be expected to drag the billboard in their wakes. The word "reasonable" is always inserted in the billboard industry's declarations, and thus far they have found no legislation or regulation that they regard as "reasonable."

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A letter from London by Charles R. Johns, secretary of the National Canine Defence League, is printed in the November issue of *The National Humane Review*. It adds a new sidelight on the heroism of Londoners in the present struggle, describing the work being carried on to rescue animals from the results of bombing, and to care for, or humanely dispose of, the injured dumb animals. It is only another proof that in the face of disaster the Britisher has not lost his sense of values, and of right and wrong. Dogs are not admitted to human air raid shelters, but shelters are being provided for dogs, and clinics maintained, even during blitzkrieg. Mr. Johns does suggest that it was a bit unwise for some workers to attempt the rescue of several young pigs when a time bomb was expected to explode at any moment and do away with workers and pigs alike. Still, it was a rather gallant gesture.

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Although the 1940 season on migratory waterfowl is drawing to a conclusion—with more than 1,100,000 duck hunters enjoying Mr. Ickes' regulations, conveniently liberalized during a presidential election year—we should like to print as a matter of record the pertinent remarks of Aldo Leopold of the University of Wisconsin, published in the November, 1940, *American Forests*, the magazine of the American Forestry Association. One of the best-informed conservationists in the United States, Dr. Leopold speaks with an authority born of intimate knowledge of duck hunters, ducks and conditions generally and specifically. Aldo Leopold wrote:

"The liberalization of waterfowl shooting seasons, re-

cently announced by Secretary Ickes, is an event to give pause to all thinking conservationists, including duck hunters. 'The rehabilitation of the ducks . . . should stand for all time as a monument to practical conservation.' With this rosy introduction, the annual report on duck status proceeds to itemize:

"Spring migration: 'While the rate of increase showed a tendency to decline, the situation was considered satisfactory.' Pacific Flyway: 'The Alaskan nesting grounds are still greatly under-populated.'

"Mississippi Flyway: 'Improvement in Alberta and Saskatchewan, drouth in Manitoba.' 'In some instances, at least, restored water areas were immediately adopted . . . by waterfowl.' 'Population is on an upward swing.' Atlantic Flyway: 'Very little improvement over 1938.' Nesting in the U. S.: 'Shortage of water in most of the Great Plains . . . but improved conditions elsewhere.'

"Fall migration: 'Most satisfactory in Atlantic and Mississippi regions, a very slight improvement in the Pacific, and a distinct loss in the Central.' Conclusion: 'The January inventory indicates that the continental population (of ducks and geese) is about 65,000,000, nearly two and a half times the size of the stock in 1935.'

"Do these itemized reports add up to anything more than a good start toward rehabilitation? Considering the untiring shooters' lobby and the nearly continuous drouths, it is of course a 'monument to practical conservation' that we have any ducks left at all. But is a continental stock of half a living duck per citizen and forty living ducks per duck hunter a very high monument?

"Is the low ebb of 1935 a fair base for measuring increase? In another (and seldom quoted) report, our present duck stock is estimated as half of that of 1900. If we were to use 1900 as a base, our 'monument to conservation' would be underground. The basic question is one of standards. Should we draw off all the increase in ducks, or leave a margin for safety? Is 65,000,000 ducks good enough, or do we aim for two hundred millions?

"If we have another lucky year in respect of drouths, botulism, and delayed fall flights, 1941 may bring a further increase, despite Mr. Ickes' liberality to hunters. If the opposite, 1941 may bring a setback to 1935 levels.

"We hear much, nowadays, of national belt-tightening, of willingness to curtail present pleasures for the assurance of a future. Have duck hunters heard of it? We also tried mortgaging the future in order to bolster present prosperity. Have duck hunters heard of this?"

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On October 16 a flotilla of patrol boats, manned by armed men under the direction of a Florida conservation agent, opened fire on porpoises disporting in Mantanzas Bay. Telegrams began to fly from St. Augustine and Marineland to Tallahassee and to Senators and Congressmen. Conservation Commissioner R. L. Dowling disclaimed any knowledge of an order for a vendetta on the porpoises and ordered the agent to desist. Mr. Dowling pointed out that porpoises were not protected by law and that they feed on various species of food and game fish. However, aroused public opinion put a stop to an unjustified program of extermination that undoubtedly had its origin with sportsmen who were jealous of any competition.

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At the recent meeting of the American Ornithologists' Union in Boston and Cambridge, word was passed around that an offer of $700 had been made for an egg of the California condor. This offer, stated to have been made by a Canadian, thought to be an agent for some foreign collector, was the cause of considerable comment around the lobbies. The consensus of expressed opinion was against the deal going through.

The California condor, formerly relatively common and widespread, is now reduced to a few dozen individuals, breeding only in a few limited areas in southern California and northern Lower California, and can be saved only by the best efforts of all who are interested in its continued existence. While we are convinced that moderate collecting of the eggs of a wild bird that is common over a wide range has no appreciable effect on the population of the species concerned, this is not true of birds of limited distribution, and especially of those which, like our condor, are especially susceptible to the unfavorable conditions that accompany intensive settlement.

Several species of British birds that have always been limited in distribution and have suffered under the handicaps of size, particular nesting requirements, and real or fancied injurious habits, are now the recipients of solicitous care by people who have learned that sport and meat do not fill all the needs of mankind, and that a fair population of all species, even a few predators and scavengers, should be preserved. In the case of several notable British species the egg collector is probably the most active force that now threatens extermination. A few of our own birds seem to be likely candidates for this class.

It is hoped that this order for the egg of a condor will not be filled.

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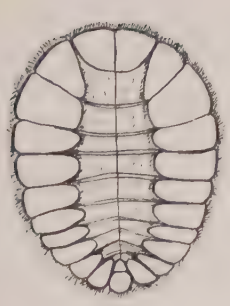
The annual meeting of the Izaak Walton League of America will be held in Washington, D. C., March 27 to 29, breaking a long precedent of the League, which has traditionally met in Chicago. The program for the League's meeting will center around three major issues. These are: 1. Means for correcting nationwide pollution. 2. Means for correcting abuses of public rights in water occasioned by indiscriminate high dams which ignore biological functions of water and recreational values. 3. A forthright program for protection of remaining wilderness areas against any and all encroachments. During the sessions there will be a half-day visit to the Patuxent wildlife research station at Beltsville, Maryland, where representatives of the Fish and Wildlife Service of the Department of the Interior will demonstrate latest scientific practices in wildlife investigation, which includes studies on the interrelationships of wildlife with agriculture and forestry. Headquarters of the convention will be at the Willard Hotel, and most of the sessions are open to the public interested in conservation problems and their solution.



LARVA

PENNIES FROM THE WATER

By BERNARD SEGAL

ADULT

YES, there are pennies in the water; living pennies, in great abundance. Unlike copper pennies, the water-pennies may be easily picked up by everyone, in every stream or brook. You, too, may come upon a treasure of these pennies near at home. No equipment is needed for this treasure hunt; no preparations necessary. All we need is a free afternoon, a keen eye and a lust for fun.

As we stroll along our brook let us pause at a spot where the water breaks over emerging rocks into a lively ripple, dazzling in the sunshine. Here our little stream indulges in a carefree, childish, tumble-rumble game, sifting sunbeams through its curly wavelets. It splashes its glistening pure waters over a shallow, clean bed of sand, pebbles, gravel, rock, and boulders green with slime and moss. These are the miniature, make-believe cascades, rapids and waterfalls of our little brook. Off go our shoes and stockings. Rubber boots may be more convenient, but the pleasant feeling of cool water gently hugging our bare legs compensates for the slight discomfort of the few initial steps over the rough shallow.

About mid-stream we shall roll up our sleeves and begin digging for the treasure. We shall select a smooth rock of reasonable proportion and hold it in our hands, bottom side up. A host of squirming, wriggling, and crawling animals of many shapes and forms will greet the eye. Momentarily dazzled by the sudden flood of light, they soon recover their senses, and react each after its own nature. Some of them will quickly find their way toward the borders of the rock, slip through our fingers and drop back into the water. Others will creep into crevices and nooks in the rocks, or will crawl into their silky tubes and nets, while still others will remain motionless, feigning death, their coloration and structure fitting in perfectly with the texture of the rock. We will not do any harm to those scuttling for a safe escape, or disturb those remaining in their safe retreats. We are not after them at the present. If the rock is not too heavy we shall hold it in the sunlight until most of the water trickles off the sides, and only a thin film of moisture covers the brownish-green slippery surface.

In a short while, under the influence of the bright sunlight, what looked like pebbles, specks, spots, and scars on the rock will come to life under our very eyes. Slowly they will give themselves away by a slight movement, a change in direction, an attempt at an adjustment to the strange condition we created for them by lifting their "world", the rock, out of the bed of the stream. These are all living things that adhere closely to the surface of the rock. They are protected by virtue of their inconspicuousness, by resembling the background on which they live, and by their diminutive proportions. What looked like a scar on the rock will, now that the film of water has evaporated, show a definite structure of its own. Parts of the body, head, thorax, and abdomen, may be discerned. Tiny legs and antennae may be recognized. Segmentation of the body will be disclosed upon closer scrutiny.

Let us now look for a flat, disc-like body, that exhibits a pattern of lines and marks on its grayish-brown horny surface. We may have good luck and come upon a "herd" feeding on the slippery pasture of brownish-green growth of algae. Annoyed by the sudden exposure to sunlight, they will interrupt their feeding and glide furtively across the rock to escape the limelight, shy creatures that they are.

These are the water-pennies!

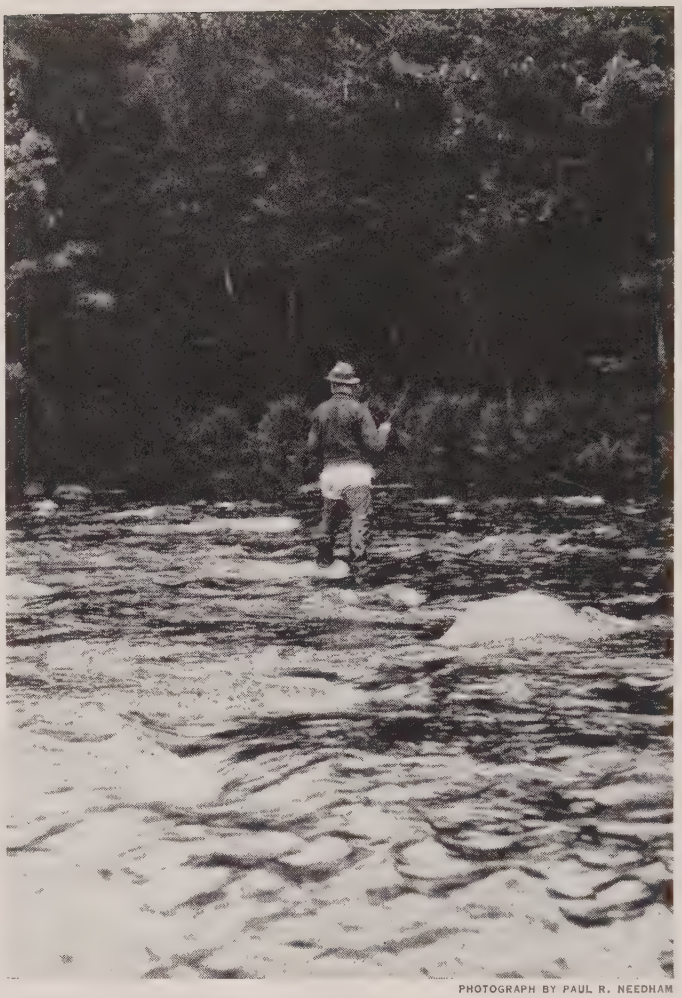
Let us watch their movements for a while before picking up some of them. There is no danger of losing them. They are very slow in their movements. Our oval speck, having detached itself from the stone, is sliding awkwardly. You would hardly call it walking, as no legs are visible, and the body is not raised above the surface of the stone. Only the tail-end of the semi-circular carapace flaps constantly as if gasping for water, for these animals breathe in the water by means of gills that are situated on the underside of the body. By this constant flapping of the tail-end, a current of fresh water is kept flowing over the delicate tufts of gills underneath the snugly adhering carapace, and the supply of oxygen is renewed.

We may wish to look at the underside, the tail side of the penny. We shall find it is no easy task to remove it from the rock; nor do its enemies. The water-pennies find considerable safety from the predacious animals in the water because of the difficulty with which they are pried from the rock. They cling tenaciously to their foothold. We shall carefully, so as not to injure the body, slip a thin scalpel, or razor-blade, or the edge of a pocket knife, under the margin of the penny and gently overturn it. We shall discover a concave shell that shields a tiny head, three pairs of short struggling legs, and a row of white filaments waving continuously to and fro on either side of the abdomen.

Here, then, we behold a tiny creature, only about a tenth of an inch in length when fully grown, that is capable of withstanding the rapid flow of water. They are found in the most rapid streams and torrents. I have picked up

several of them in the rapids of Niagara only 500 feet above the Falls. How do they manage to cling to the stone and forage freely in the face of currents that sweep everything in their wake? The smooth, closely-fitting upper surface allows the water to flow over and offers no resistance to the current. The concave, bowl-shaped lower surface adheres to the substratum like a cupping glass. A rock, a log, or a shell of a clam in the water offers a stronghold and a forage ground, as well as safety from enemies.

The water-pennies are not really full-fledged insects as yet. They are only the infant stage, the larvae of a small beetle known to entomologists the world over under the name of *Psephenus*. This is, as are most scientific names of insects, a Greek word. In this case it means, "obscure."



PHOTOGRAPH BY PAUL R. NEEDHAM

TYPICAL "WATER PENNY" WATER
These obscure little insects do not mind how swift the stream may be because they are strong in attachment

But before the water-penny is transformed into a blackish flying beetle, it must undergo another change. When the penny has outgrown its larval stage, it forsakes the swiftly-flowing waters and moves shoreward. There it nestles itself snugly beneath stones, roots, or decayed leaves in the banks. The situation it prefers is a place somewhat above the water level, yet constantly kept moist. There it transforms into a pupa. This is the second stage in the life of the beetle, *Psephenus*. It is a stage of apparent inactivity or sleep, or so it seems to us. We judge active life by visible motions, by food taking, or some such external activities. Yet under the reddish shell of this resting speck, the most wonderful transformation is taking place—a transformation nothing short of miraculous. In a short period of two weeks the flat, stone-hugging, water-soaked penny will change into a blackish, alert, agile, air-breathing beetle. It is as unlike the penny we started out to find, as the bird is unlike the egg out of which it has hatched. The little beetles escape the narrow confines of the pupal cases; they scorn the muddy, dingy home of their cradle; but they never forsake the rumbling, splashing brook. They spend their short adult life flying agilely in the vicinity of the water, hovering over shoreline trees and bushes, or rambling over emerging rocks. They feel at home under water as well as above it, always carrying a supply of air bubbles with them during diving ventures. In due time the female *Psephenus* will lay masses of round, yellowish eggs, which she glues to the underside of flat stones in the shallows of the brook. Out of these will hatch, if no misfortune befalls them, a new generation of water-pennies.

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Dust-bowl Rosary

By HESTER MISHLER HARLAN

Faint call of whippoorwill, at even-tide;
White lilacs, in the rain; the yellow lace
Of moonbeams falling through tall verdant trees;
And lazy hum of bees, in clover field
Beyond the barn. The little snow-white lambs
I brought in from the cold . . . the chirping chicks
In box behind the stove, on rainy days.
Old Rover's soft brown eyes . . . Dark violets
That grew on mossy rim down by the spring . . .
Thin chirp of cricket, as I heard it sing
Its hearthstone song; and bells on cattle as
They filed along their narrow homeward way.
Rose gray of country dawn, and quietness
Of twilight on the farm. These I have known.
I count them over, oh so tenderly,
My cross supported by each bead of memory.

Trousers and Trowels

What happened when the men decided there should be more pants and less pink tea in the garden

By ANDREW S. WING
Garden Editor, Nature Magazine

THAT WOMEN are better joiners but men are better gardeners might be assumed from the claims coming from the headquarters of the Men's Garden Clubs of America. Yes, in case you had not heard, there is a national men's garden club; an active and enthusiastic band. In numbers it is still fairly small, there being around 2300 members at the last official count, but the organization is eight years young, and in that short time it has made quite a dent in the traditions of the gardening world.

In the federated garden clubs, including the exclusive Garden Club of America, there are, we are told, some 130,000 members. These are mostly women, although there are garden clubs that are "coeducational". There are, also, many clubs that, for one reason or another, remain independent of state or national affiliations. In addition, there are such specialized groups as the American Horticultural Society, the American Rose Society, the iris, dahlia, gourd, herb, begonia, orchid and other associations, and numerous state and local fruit, vegetable and other horticultural organizations.

In short, there are garden clubs and garden clubs, ranging from small-town and rural groups, whose members do bare-handed digging and achieve remarkable results with shoestring budgets, to exclusive upper-income clubs where membership is equivalent to being in the Social Register. It is interesting that even among the ritzier clubs there are groups of advanced horticulturists. Many wealthy lady gardeners like to don brogues and britches and to dig in their own earth. Others, like a well-known garden editor, prefer to make out work orders for their head gardeners, and confine their actual gardening to a weekly tour of the premises to see if Joe or Jenson has followed instructions.

There are school garden clubs and 4H clubs of farm boys and girls. These are doing a fine job by instilling interest in, and knowledge of, the growing of edibles and ornamentals. There are clubs where few of the ladies even pretend to do any real gardening, but confine their efforts to tea-cup chatter and arty flower arrangements done with borrowed flowers.

Dirt gardeners have an undisguised contempt for those who do most of their work with a salad fork. Perhaps that has had something to do with the growth of the men's garden club movement. It may also be more than a coincidence that the founding date of the Men's Garden Clubs of America falls in the year 1932. That year marked the depth of the depression, and it has often been noted that interest in gardening increases in hard times. It is also worth noting that as the interest in gardening increased, golf-club memberships shrank. Many golfers decided it was not only cheaper but more fun to cultivate a garden than to dig divots in a fairway. Far be it from me to compare the art of gardening with the sport of golf. Both have their points. I speak as one who has tried both, and when faced with the decision as to whether it was to be gardening or golf, since neither time nor money could be stretched to include both, I parked my golf clubs in the attic forever. It seems to me that gardening offers the greatest pleasure and the more lasting satisfaction. Did you ever hear of a golfer playing a game that really pleased him? I never have. There are always putts that failed to drop; shots that bounced away from the hole instead of toward it. The score could always have been better, if. . . . His only solace is to tarry at the nineteenth hole after his shower, thus arriving home late for dinner and being confined to the family doghouse for a week.

MEN'S GARDEN CLUB DISPLAY AT THE ALBANY FLOWER SHOW
The club was seven months old when it decided to show its mettle as an exhibitor and went off with an award

A garden, on the other hand, while it, too, may bear

its share of bitter fruit, usually compensates one for his labor. Rare indeed is a garden a complete failure, for even in a season of drought or pestilence there will be some show of flowers, or harvest of tree, root or vine. A friend used to say that he "buried his troubles in the garden". Hope springs ever green in the gardener's breast, and in a world torn by war and political strife, the blooming of a single flower on a carefully nurtured plant may bring peace to a tortured soul.

Now do not imagine for a moment that the members of the Men's Garden Club of America are escapists shrinking from the stern facts of life, or esthetes who dabble in pastel shades and balanced designs. Far from it. Their very slogan, "More Pants in the Garden", bristles with militant masculinity, even though some members prefer it spelled, "More P(l)ants". These men have been accused by their feminine rivals of specializing in such crude things as giant dahlias and redder poppies. To this the men reply that when gardening degenerates to the mere fiddling with a couple of bare twigs in a dry bowl, it is time that men restored it to its original old-world sturdiness and simplicity, where a gardener is as proud of his cabbages and cauliflowers as he is of his delphiniums and lupines, and the art of flower arrangement is considered an oriental pastime. As Frederick Frye Rockwell, a tweedy, barefisted gardener, who is president of the Men's Garden Club of New York, has said, the men felt that it was "time for more terra firma and less pink tea in American horticulture".

SEVERAL OF THE CLUBS HAVE PUBLICATIONS
They have been given interesting names descriptive of the masculine activity in the garden. Here is the Albany club's heading

Now I do not want to convey the impression that the men neglect the artistic side of gardening for the cultural, for that is not the case. But men do become specialists more often than women. For instance, George B. Dobbin of the Jackson, Michigan, Horticultural Society, told me that he grew first every kind of dianthus that he could find; then he took up *Myositis,* delphiniums, and finally primulas. He now has between 3000 and 4000 primulas (primroses) in his garden. He is not typical, of course, but there are a good many like him. Women become specialists too, sometimes, but are more likely to work for general effects in the garden. Men are often more thorough in a cultural sense, whereas women are cleverer at color schemes and artistic effects. Generalizations are usually unfair and misleading, especially when it comes to the sexes. Perhaps it would be well to say that there are still many more women gardeners than men, but that when a man begins to talk about his garden, he has usually got something to show you.

Because in America, unlike England or the Continent, gardening is commonly regarded as a feminine pursuit, the male gardeners over here are inclined to be a bit ostentatious about their whiskers and other evidences of masculine supremacy. Be that as it may, they are getting a lot of fun out of their home gardens and their club activities.

It all began back in 1927 when a Chicago newspaper staged a garden contest, putting up $1000 as first prize. Naturally, such a fine award attracted a great many contestants, both men and women. When the judges had made their last round of gardens, they had a long huddle and finally handed the $1000 check to a man—an electrical engineer named Lee W. Nack, who had created a very lovely little garden 45 by 60 feet in size on a narrow 45 by 125-foot lot. This served to fire the fervor of Mr. Nack even more and that winter, believing that the contest might be continued, he called together a group of men gardeners in a Chicago hotel to exchange ideas that might be of mutual interest. Sixteen men responded, and thus at a dinner at a Chicago hotel on February 28, 1928, the men's garden club movement was born. Another meeting was held about a month later at which Mr. Nack was elected president, and James H. Burdett, secretary.

Two years later out in Iowa, where they grow not only tall corn but many beautiful gardens, J. N. ("Ding") Darling, the famous cartoonist, got together a group of men gardeners in Des Moines, and with characteristic enthusiasm sold his friends the idea that they should have a men's garden club in Des Moines. Naturally, "Ding" was elected the first president. Next came Aurora, Illinois, with a group led by W. B. Lathrop, who had been inspired by the meetings he had attended in Chicago. Formal organization of this, the third men's garden club, came early in 1930. Fort Wayne, Indiana, was next to fall into line with a meeting in February, 1930. February, by the way, seems to be a fateful month in garden club history, perhaps because "gardening sap" begins to rise about that time.

It was inevitable that an interchange of correspondence and visits between these nearby clubs should occur, with the result that a closer and more formal affiliation seemed desirable. So, on September 26, 1932, a group representing the four clubs met in Chicago and cemented their union with constitution and bylaws. After that was done they elected Alfred C. Hottes, Des Moines garden editor, president; Don White of Fort Wayne, vice president; Will B. Lathrop of Aurora, secretary; and James H. Burdett of Chicago, treasurer. What these united spade wielders lacked in numbers they made up in enthusiasm, and the idea began to be noised around. The first annual meeting was held in July, 1933, during the Century of Progress, with Alfred Hottes wielding the gavel. Besides the business and discussion meetings, formal recognition of the Men's Garden Clubs of America was given during a visit to the Fair.

During the next year, Cleveland and Lancaster, Pennsylvania, entered the national body with thriving sapling

clubs. The 1935 convention was held in Fort Wayne, and by this time veteran members held a real reunion. The last resting place of John Chapman (Johnny Appleseed) was visited, and this spot, sacred to American gardeners, has since been restored by members of the Fort Wayne Club. It has become the custom for the national body, at the annual convention, to make a "Johnny Appleseed Award" to the men who have made the greatest contribution to American horticulture.

Since these formative days there has been steady progress in memberships and in the number of clubs affiliated. On July 18-20, 1940, the eighth annual convention was held in New York City. Besides the usual business, visits were made to Gardens on Parade at the World's Fair, to the New York Botanical Garden, and to nearby gardens and nurseries of note. The enrollment at that time consisted of about 2300 members in 29 clubs in fifteen different states, mostly in the middle west, but extending from Fort Lauderdale, Florida, to Corvallis, Oregon.

At this convention the men thought it would be a cute idea to have a competition between men and women to see who knew the most about garden names. There were five men and five women in the opposing teams, and the men suffered a decisive defeat. However, undaunted by this academic downfall, the men still proudly maintain that they are the best "feet-on-the-ground" gardeners.

Most of the clubs issue regular bulletins which bear such picturesque names as *The Nozzle* of Danville, Illinois; *The Earthworm* of Elmhurst, Illinois; *The Spreader* of Syracuse; and *The Stamen* of Pittsburgh. Facetious though their names may seem, their content is largely club news and practical garden information and advice.

Club activities consist of regular dinners or luncheons, followed by a talk by a visiting celebrity or a local member. These events are interspersed during the growing season by picnics, barbecues, and other social affairs. While sociability and good fellowship prevail, the bond that holds the various groups together is a genuine interest in growing things in the home garden.

Many of the clubs have gone in for some form of civic betterment such as the beautification of highways and blighted areas, school garden contests, etc. The Cleveland Club, for instance, staged a successful amaryllis show, while the Albany club won first prize in a club display contest from the women's clubs, and even beat them at flower arrangement! Members are mostly of the professional or business class, middle-aged, often college-bred, with comfortable incomes but not in the lofty income-tax brackets.

Perhaps the Men's Garden Clubs of America will never catch up with the women's clubs in total members. But at least the idea has existed long enough to demonstrate that gardening is not merely a feminine fad, but that it can be enjoyed equally by the most virile of men. Also, it can make contributions to horticultural progress.

In a little booklet descriptive of the garden club movement for men, the Men's Garden Clubs of America make the following rhymed appeal for other men to get on the band wagon, organize and federate:

How oft have you thrilled at growing things
And wished for that something which gardening brings;
But you didn't know where or how to start
And you and your dreams soon drifted apart.
Well—here is the answer throughout our land
There's a Men's Garden Club movement that's simply grand,
Here doctors, lawyers, merchants and chiefs
Get together to share and discuss their beliefs,
They take pride in home grounds; they take garden trips;
They spread fertilizer; they chase away thrips;
They rub shoulders together; close friendships ensue
In this circle of friendships may we include you?

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My Garden

By E. F. HEYDINGER

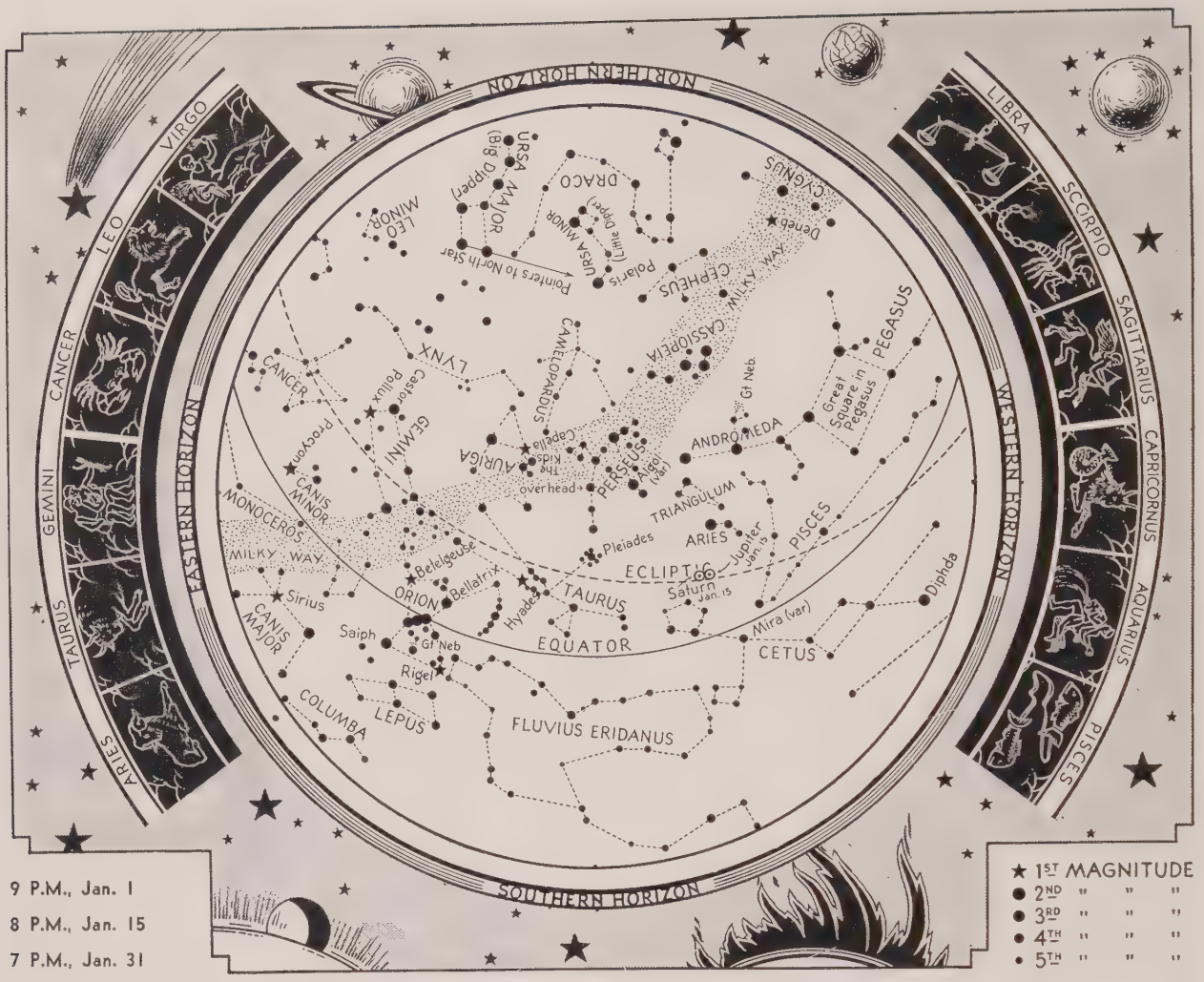
Come walk with me in my garden, dear,
Come take me by the hand,
We'll walk through elfin shadows and
Through sun-kissed meadow land.

I'll lead you to the pasture rose
That drapes the old oak stump,
I'll lead you to the tulip tree
And through the pawpaw clump.

Maybe we'll catch a stray sunbeam
Asleep in the deep dell dew,
Maybe we'll see a johnny-jump-up
Gathering its heavenly hue.

Come walk with me and linger, dear,
While lengthening shadows creep
From out the west to greet the night
That puts the day to sleep.

We'll sit and look into the trees
And watch the moon beyond,
We'll listen to the rustling leaves
And to the tree toads' song.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Heavens in 1941

By ISABEL M. LEWIS

A COMET readily visible without a telescope in the evening sky; a total eclipse of the sun in Asia and the Pacific; the last of three conjunctions of Jupiter and Saturn within six months, completing the triple conjunction of these planets, which is one of the rarest of celestial events; the return of Mars to opposition, and within 38,000,000 miles of the earth—these are a few of the predictable astronomical happenings for 1941.

Comet Cunningham, which was discovered by L. E. Cunningham on a photographic plate taken at the Oak Ridge Station of the Harvard College Observatory on September 5, 1940, was in the constellation of Cygnus at the time of its discovery. Its brightness was estimated to be approximately of the 13th magnitude, which would make it visible only in fair-sized telescopes. Within a month it had increased to tenth magnitude and had a sharp nucleus, round coma or head, and a tail several minutes of arc long. It has been moving in a generally southerly direction between Cygnus and Lyra toward the foot of the Northern Cross and should be between Albireo and Altair at the beginning of the year. It is difficult to estimate in advance just how bright a comet will become because, in addition to shining by reflected light from the sun, comets shine by their own light. The loosely-held particles of which the coma is composed, and the gases intermingled with them, are heated to incandescence as the visitor from space draws in toward the sun and is exposed more and more to its heat.

Certain comets shine much more brilliantly than others, depending upon their composition. Some have estimated that Comet Cunningham will scarcely be visible to the naked eye in December; others that it will be easily seen before Christmas, and that in the early part of January, when it will be at its brightest, it will be the brightest comet that has appeared since Halley's periodic comet, which was a magnificent object at its last return in 1910.

In that same year there was also a second comet easily visible to the naked eye, but since that year there has been no comet bright enough to be conspicuously visible to the naked eye although there have been many *telescopic* comets observed since that date. Let us hope that we may see Comet Cunningham in January without having to strain our eyes to do so! About January 18 it will be in perihelion, or nearest the sun, at a distance from it of about 35,000,000 miles, and about 60,000,000 miles from the earth. It will not be visible to northern observers after the middle of January, when it will pass below the southern horizon.

There will be, in 1941, two eclipses of the sun and two of the moon. The lunar eclipses will be partial eclipses only; the first, on March 13, will be visible generally in North America, western South America, Australia and eastern Asia. At the greatest eclipse thirty-three hundredths of the moon's diameter will be covered by the earth's shadow. The second lunar eclipse will occur on September 5 and will be seen in Australia, Asia, Europe and Africa. This is a small eclipse for the greatest magnitude will be only six-hundredths of the moon diameter.

On March 27 there will be an annular eclipse of the sun. This will be seen as a partial eclipse over New Zealand, all of South America, except the extreme eastern part of Brazil, and most of Central America. The annular phase of the eclipse will last for about 7 minutes, 41 seconds, and the path of the annulus will cross the South Pacific from a point directly east of New Zealand. It will graze Easter Island and pass over Lima, Huancayo and Cuzco, among other towns, in Peru late in the afternoon. Crossing the northern part of Bolivia, it will enter Matto Grosso in Brazil where it will leave the earth at sunset. Of much greater general and scientific interest will be the fine total solar eclipse of September 21, which, however, may have few observers from outside the countries over which it passes; for its course lies across western Turkestan and China. It will start at sunrise midway between the Black and Caspian Seas, cross the latter sea and the Aral Sea and pass over Alma Ata in Turkestan and lofty mountains, plateaus and deserts in western Asia. At high noon the eclipse will be total in a densely-populated part of China, including the towns of Hankow and Nanchang. It will also cross the northern extremity of the island of Formosa, graze the island of Guam and pass over the islands directly north of it. At sunset it will leave the earth a few degrees west of the date line in latitude ten degrees north. The maximum duration of the total phase of this eclipse will be about three minutes and twenty-one seconds. This will be on the coast of China about noon. Large partial phases of eclipse will be observable over a great part of western Europe and Asia and in the Pacific near the path on either side. Practically all of Asia will see a greater or less eclipse, as well as most of the East Indies and northern Australia.

Among the planets, during the coming year, the third conjunction of Jupiter and Saturn on February 20 will be of outstanding interest. The first was on August 15, the second on October 11, 1940. These two planets, which kept so close together during 1940, will continue to do so during the winter and spring of 1941, but by the end of the year Jupiter will be leaving Saturn well behind in their trip around the sun, which Jupiter will complete in a little less than twelve years. Saturn will need more than twenty-nine years to make the journey. By the end of the year Jupiter will be between the horns of Taurus, while Saturn will be considerably to the southwestward of the Pleiades.

An odd phenomenon that will occur on May 11 will be the five conjunctions of planets, all on one day, in the evening sky and all too close to the sun to be seen. Venus will be in conjunction with Mercury, Jupiter, and Uranus; Mercury, in addition to being in conjunction with Venus, will be in conjunction with Jupiter and Uranus. Saturn, in conjunction with the sun two days earlier, will also have been in conjunction with both Mercury and Venus in the evening sky during the preceding week.

Mars, which at the beginning of the year is in the morning sky in Scorpio, will draw continually away from the sun until it is on the meridian due south at sunrise on June 2. It is coming north and improving its position for observers in the northern hemisphere. It will be nearest the earth, and at a distance from it of about 38,135,000 miles, on October 3. October 10 it will be in opposition to the sun and visible all night. This is one of the more favorable oppositions of Mars. Although the planet was about 2,000,000 miles nearer the earth in 1939 it was so far south that it was not seen to advantage in the northern hemisphere. Conditions in that respect will be much more favorable this year for, at opposition, Mars will be north of the equator in Pisces. The surface of the planet will probably be under observation from July to the end of the year. Outside of this period one cannot expect to see to any advantage the surface markings of the planet because of its distance and unfavorable position.

Venus, now resplendent in the morning sky, is slowly drawing in toward the sun and will be in superior conjunction with it on April 19 when it will pass to the evening sky. It will be an evening star from then on to the end of the year and will be farthest east of the sun on November 23 and at its greatest brilliancy on December 28.

Mercury, always darting back and forth from east to west of the sun during its brief period of revolution around the sun of only 88 days, and never far enough from it to get out of the morning or evening twilight, will be seen in the morning sky this year for ten days or so near the dates of its western elongations on March 25, July 23, and November 11, and also in the evening sky near the dates of its eastern elongations on February 10, June 5, and October 3. For the remainder of the year one may not expect to see much of this elusive little planet except with the aid of a telescope. One may, on occasion, pick it up telescopically in daylight.

Jupiter and Saturn, keeping close together in the early months of 1941, draw apart toward the end of the year. Jupiter will be in conjunction with the sun on May 19 and Saturn on May 9, when they will pass, respectively, to the morning sky. Jupiter will be in opposition December 8 and Saturn on November 17, visible all night.

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

New Year's Ambitions

The president of one of the major scientific supply houses recently wrote me about a letter he had received from an elementary school teacher. The teacher wished the supply house to send her a picture of "every animal in the evolutionary column from the amoeba to man."

No one can criticize the teacher for having a high ideal. Neither can one be surprised that the supply company's executive formed a questionable opinion of the institution that trained the teacher in question. Nor can one object to the desire of teacher trainers to develop in teachers some concept of evolutionary development. But this cannot be done in a truly significant way by presenting high-sounding generalizations without an adequate background of supporting experience. Why deprive the teacher of the pleasure of letting the magnitude of evolutionary change dawn on her after she has had a number of significant experiences? Why give her the dessert first and give her nothing else?

These ambitious educators have long tried to force development of their students unreasonably. The results of such forcing are often—too often—ludicrous. Some years ago, the State of Iowa attempted to train its elementary teachers through a six weeks' course so that they could teach agriculture satisfactorily. This applied to experienced teachers in service and to teachers in preparation. Nine hundred and ninety-nine of these teachers took a summer course in agriculture in the school in which I was then teaching. I had the pleasure of looking over the answers to one question in the final examination. One teacher, who was asked what "dual purpose cattle" were, explained in great detail that they were cattle raised exclusively for fighting purposes. An ideal composite dairy cow constructed from the answers on this examination would have been one with a "deep chest, a broad bosom and a big rudder." Now, I ask you, how much agriculture do you suppose those teachers understood, even though they might have passed the rest of the examination with flying colors? You cannot make farmers out of school teachers by having them in a classroom for thirty hours. Neither can you make scientists out of teachers by attempting, in a similar length of time, or in much more time, to present the profundities that science has developed through the ages.

At a recent professional meeting, one speaker defended vigorously the idea that one must at least appear to be erudite; that one must be profound; that one must give a "he-man" course instead of a course that the pupil might be expected to understand. It happens that this same speaker, not long ago, told me of his experiences teaching a class about reptiles. He apparently wanted to impress me; so he told me of a rattlesnake that laid eggs in the classroom and of the thrill the children got in watching the development. Although I knew that rattlesnakes do not lay eggs but give birth to living young, I never cracked a smile. Apparently having won a point, this trainer of teachers, who vigorously defends being profound, went on to tell me of a "downy-headed woodpecker" and a "rusty-winged blackbird" that visited his school feeding station. Somehow, after having had these experiences with the gentleman, I was not impressed by his plea for erudition. Is it not possible that this attempt to appear profound is a defense mechanism; a camouflage to cover weakness that, if exposed, might prove professionally fatal?

Is it not time that we make a few New Year's resolutions to defend the dignity of the simple for a year at least; to see whether we will not make as much or better progress if we learn to creep around our own front yard before we cruise in an imaginary rocket ship through interstellar space; to see whether we do not have better intellectual digestion by beginning with soup and ending with the ice cream and nuts? Those who must make a meal solely of nuts will, of course, be victims of their own folly. Let us leave them to their own miseries.

There is need for all of us to resolve this New Year that we will recognize the dignity of the simple not only in academic nature but in Nature education as well. There is real danger that if we do not, we will find ourselves, after cruising around the clouds of profound thought, suddenly out in clear air with no parachute to bring us safely back to the facts of the earth.

During the Christmas holidays and the interim between terms, there will be many meetings of those interested professionally in teaching in the fields of science and of Nature. In general, these meetings will be well attended. They will be held at different times and at different places. Some will be organized to meet the needs of teachers of different states. Others will be organized to satisfy the interests peculiar to certain teachers from many states. It seems that there is so much of merit in this system that it is worthy of preservation against certain proposed changes.

There are those who would wish to combine all of these groups under one head; who ask that, while these individual groups maintain a certain sovereignty, they combine to support a national paid secretary. It is asked that all these groups combine to back a single journal that presumably will serve all science teachers. The leaders of this group recently claimed publicly that they were in a position to get the withdrawal of all advertising contracts now supporting the existing journals and were prepared to use this for the support of the single national journal.

Correspondence with officials responsible for the publication of the professional journal now serving the largest number of teachers of science and of mathematics shows that they do not feel justified in entrusting their journal, which has been published continuously for forty years, to a group seeking outside help on a year by year basis.

While the writer recognizes merit in joint action, he definitely disapproves the "fuehrer" technique by which this group, without a journal of any considerable size, presumes to preempt fields now more or less adequately served by a number of existing journals. Surely, some cooperative plan can be worked out that will make the best use of groups that for decades have given a sustained and worthy service without having to resort to gangster methods in bringing about such cooperation. The mere suggestion that such disciplinary measures might be employed invalidates, in the writer's judgment, the claim which this group makes that it can and will provide a truly responsible and representative leadership.

The encouraging thing about this situation is that when similar threats have appeared in the past they have proved to be duds, even though they have been expensive duds. It is hoped that the present crisis may follow a similar course.

It would be well for those attending professional meetings during the next few months to remember the fate of Norway and of Denmark, which accepted a protective occupation by ambitious outsiders. Resolutions approving this type of cooperation should be scrutinized carefully and appropriate protective reservations should be made. Resolutions are ordinarily rather innocuous things, but where they delegate authority to outside parties, and where there are enough of them, they may have a boomerang effect on the group that sponsors them. A good New Year's resolution might be to make fewer resolutions, or even to make none at all.

It is unfortunate that many of the policies that the every-day teacher is compelled to follow are determined by those who have been seriously bitten by the convention bug. Too often does the law governing hot air rising find proof in the professional advancement of those who make the longest speeches at conventions. Some convention speeches are thoroughly worth while, but others might better never be presented.

At a recent convention, I listened for an hour to one speaker discussing his 700-page doctor's thesis on how he proceeded to develop a sound program for pre-college science. I took a twenty-minute walk in the open air, and when I came back he was still at it. The gist of his talk might be summarized by a list of ten criteria he had used in determining what should or should not be in his course. These included what he had learned from texts, from college courses, by correspondence, from talks at conventions and what he had found in periodicals and the catalogs of mail-order houses. Strange to say, not once did he mention a survey of the background of interests or experiences of the pupils who presumably would be changed by his course. When he was asked about this, he arbitrarily defended from the floor the idea that what was in mail-order-house catalogs was more important in determining what went into a course than what the interests or background of pupils might be. It is unfortunate that education has come to such an extreme as this; that merely for the sake of being consistent one must defend what he has written into a thesis in the face of common sense. Those planning convention programs should see to it that those attending are protected against papers such as these.

Of course, any organization of human be-

a women's sewing circle, or a group of professional educators, will be afflicted by those with political ambitions. At a meeting a few years ago, the secretary of one of these professional organizations insisted that he would not again run for the office he held. To help him, it was suggested that he serve as chairman of the nominating committee—then he could keep himself out of office and put in whom he wished. This he refused to do. When a certain nominating committee was suggested to him he objected, offering an alternative list. When this list was accepted, the nominating committee promptly renominated him for office, which he gladly and willingly accepted. This man is a good man in his field, but his childish ambition for political recognition in this case at least made him appear ludicrous. It might be worth while developing some system that could do away with this sort of thing. It is altogether too common in organizations that pretend to have professional standing. When planning a philosophy for this next year, then, let us keep in mind the merit of simplicity, the value of independence and the dangers of ambition.

MINIATURE LANDSCAPES

(Continued from page 20)

may be added here and there. They are usually found in the woods growing on rotting stumps. There are many varieties of lichens. Outstanding among them are those with goblet-shaped tops, and those whose tops consist of scarlet or brownish-red lobulated crowns. The latter variety is branched. The individual red-topped plant somewhat resembles trees. A clump of red-topped lichens placed near a little house is strongly suggestive of a rosebush. The color of the red top is soluble in water. Washing, therefore, causes the red crown to lose much of its bright coloring.

As a matter of practical advice let me suggest how to make a deer moss landscape.

1. Make a thick paste of the soil you are to use. Make a ridge in that part of the soil where you are to plant your trees. With a knife, or nail file, cut along the ridge down to the bottom so as to make two ridges out of the one. Plant your trees in that groove and press together the two ridges over the lower ends of the trees. This avoids the awkwardness of planting trees whose trunks have become soft by their contact with the moisture of the soil.

2. Set out to dry in the sun, or, in winter, in a dish placed on a hot radiator.

3. Add what contours of land you decide upon and dry again.

4. Glue on the moss that you shaved off the bark. Thin moss, such as is peeled off the bark of trees or surfaces of stone, applied wet, shapes itself better to the contour of the land, and needs no glue to make it stay on. This, however, impairs the texture of the moss considerably.

5. Clean your landscape by mopping it with a small camel hair brush, or the small brush that you get with your small bottle of glue at the dime store. Mop and wash the brush under running water repeatedly until all the dirt is removed.

6. After its completion never put any water on your landscape. Water will refresh it for a few hours; but the after-effects of such watering will be found to be discouraging.

7. For the sake of protection from dust, you may build your landscape in a "coaster", at the margin room for an overturned tumbler to be placed over your landscape. If you plan to do so, you will get best results by mixing glue with your soil. The soil, thus prepared, sticks to the container and hardens like rock. When dry, you may glue the rim of the overturned tumbler to the dish containing your landscape. For surer cohesion, you may pack in glued soil between the glass and the border of the coaster.

8. The house may be shaped from a rubber eraser or a strip of wood. The windows are marked out with a pencil. The roof may be made from the cardboard or wood part of a match box. You may paint the roof red or green with ink. You will find that a well-shaped piece of eraser may go without a roof if its top is inked in a different color.

You can make a stony landscape without deer-moss trees. But in order to get good results you must find chips of rock that are especially "landscapy" in appearance. In such landscapes you may use lichens for trees, or clumps of green moss that resemble distant forests may be glued to the stone. Glued soil is best for such miniatures. The disadvantage of glue is in its odor. But this can be overcome by spraying with perfume after the landscape is dry. The photographs of stony landscapes are never as good as the originals.

DRUMS OF THE DYING

(Continued from page 36)

windmills to spill-over in summer to increase surface water would also help, as would rigid control of wild house cats and stray dogs, and increased cooperation with state game wardens in apprehending poachers.

It must be remembered, however, that the Attwater prairie chicken is, as its name implies, a bird of the prairie. Large tracts of rigidly-protected, moderately-grazed and moderately-burned prairie land are essential for prairie chicken survival. The maintenance of suitable prairie chicken habitat under private ownership is purely accidental and highly uncertain. Likewise, the existence of the Attwater prairie chicken will continue precarious until the government or other responsible conservation agencies acquire and manage suitable refuge areas for prairie chickens and other wildlife. Save portions of their homeland, and the boom of the Attwater prairie chicken, drums of the prairie, may beat forever. Remain inactive, and they surely die.

WHEN A GRASS IS NOT A GRASS

(Continued from page 23)

them. They include a clover, a crow-berry, and a false heather, none resembling true grasses.

"Called," not real, grasses range through no fewer than 50 plant families from curly grass, a tiny fern, to so large an herb as the joint vetch, 2 to 5 feet high, and to so well-developed a shrub as the broom crow-berry. Many of these plants, including the last two named, are not at all grass-like. Then why are they called grasses? The most comprehensive single reason, aside from resemblance, real or fancied, is that the plants serve as food for some animal. They go to make flesh as Isaiah said, so they must be grass. The other big reason, it appears, is that alleged to be a favorite with women—just because.

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ON THE RECORD

By "Disc"

"If you were marooned indefinitely on a desert island, what ten Victor or Bluebird recordings would you take along?" Richard Proskauer of the press division of RCA-Victor bows in with this question—a provocative if not entirely new sort of query. It has been asked before about books (I'll take *Anthony Adverse* and finish it); people (I'll take Rosalind Russell, Basil Rath . . . I'll just take Rosalind Russell), and about other ten bests. Nevertheless, Brother Proskauer's question is specially intriguing because it proves how mighty tough it is to pick the music you'd want to live with "indefinitely."

For this Robinson Crusoe trip we are spotted one good Victrola, which I suppose we'll have to wind up by hand since there is no mention of a local power plant. Also, the good Mr. Proskauer, admitting that this suggestion of his is quite definitely promotional, will supply us with plenty of "RCA-Victor Green Chromium Needles." He limits us to ten recordings, which sounds rather like only one side of a record. We will pick ours for the one side, but when we get to our island we hope there will be something on the reverse because we fully intend to play that side, too. Also we are given a leeway of selecting four albums, containing three or four records, these to be regarded as single recordings. We'll settle for one album.

Very well, Richard, my lad, we're all packed and ready to go; Green Chromium Needles in our money belt; RCA Victrola securely lashed to a shore-going raft; the following ten records safely, we trust, stowed in waterproof and scratchproof containers.

Back in our college days, which is some time back, we picked up a used Victrola in a pawn shop on Columbus Avenue. With frequent winding it did full justice to "A Little Love, A Little Kiss," rendered, if memory serves, by none other than John McCormack. That is, the record survived until our roommate, in desperate self-protection, dropped it out of the window into Amsterdam Avenue. This deed left us with a sense of tonal frustration and an abiding affection for this song. So because we still love it, and cherish many sophomoric memories connected with it, we must take it along. We'll settle for record Number 1691, on which Richard Crooks does the singing, rendering "Macuschla" on the reverse.

Also in collegiate days, when opportunity offered, a platoon or so of us would descend upon the stage door of the Metropolitan Opera House, there, for a consideration of fifty cents in silver, to appear as "crowd," or soldier, or minor functionary in the current opera. "Aïda" was our favorite, for it afforded nearly an entire act on stage, and we were ushered in by the stirring "Grand March," preceding the entry, as we recall, of some swarthy gentleman in a chariot. Thus this piece has become an item in our musical memorabilia, and we'll take record Number 11885, on which the Boston "Pops" Orchestra—with whose music, incidentally, we grew up—makes the recording. Furthermore, it is no liability that on the other side will be, we trust, the recording of "Pomp and Circumstance, 1," our second favorite march.

At the risk of overloading ourselves with marches, we will requisition one more. It may serve to charm any vagrant natives that may be overlooked by RCA in making arrangements, or to drive away other insular fauna. The march is the "Sambre et Meuse," a stirring thing that we have heard played under stirring circumstances in World War Number One. It will help us to forget what has come to pass in France, too. If there is one in stock we'll take Number 21456, the recording by the Garde Republicaine Band.

In the insular isolation into which Frère Richard is about to jettison us, we feel that a song of the Emerald Isle would be, as the medicos say, "indicated." We are a set-up for Irish songs, anyway, because they never wear out their welcome. For an indefinite stay this is a quality that cannot be overlooked. So we will take "A Little Bit of Heaven"—Number 20134—which is selected, partly, we will confess, because "Mother Machree" is on the reverse.

Because it has steadfastly stood the test of time, and because we have never been convinced that any more beautiful waltz has ever been written, we'll take "The Blue Danube." Of course a waltz must be in our collection, and the likeliest version of this favorite is the recording by the Philadelphia Orchestra under Stokowski's direction. According to the catalog this is Number 15425, and, what is more, it gives us a dividend of "Tales from Vienna Woods."

Picking an operatic piece with which we want to while away the desert and deserted hours was no minor task. We could easily have taken an album at this point, but even an album would be only a fraction of the many recordings left behind in what we humorously call "the civilized world." So there seems a sort of monastic wisdom in picking just one record. Because of its beauty, its lift and lilt, which should help things along on our sea-bound spot of earth, we will take "Barcarolle." We've loved this ever since the Boston "Pops" Orchestra revealed it to us some thirty years ago. On Number 1747 Lucrezia Bori and Lawrence Tibbett do the singing, which makes it perfect, and "Calm as the Night," on the reverse, is an added asset.

We can picture ourselves out there on that distant island, far from blitzkrieg and bombast, sitting in front of our leaf-thatched hut, watching the gulls and terns and boobies soar and glide. Dictator of nothing but our own soul, we will dig our bare toes into the sand, reach for a Green Chromium Needle and put on record Number 25765, which is none other than the remarkable recording of actual bird songs made at Cornell by the ornithology department. We are certain that on our desert isle we are going to need these avian voices from home fields and woods if we are to survive.

Having resigned ourselves to going on this trip of Proskauer's, we shall, of course, have to take Nelson Eddy's voice along. And we are happy that Victor has been wise enough to have him sing that beautiful, undying song from the lovely "Blue Paradise" of a quarter century back—"Auf Wiedersehen." Sadness and hope must inevitably be our occasional lot on our little isle, and loving this song as we do we need look no farther. It can be heard again and again, and should we tire of it, which we doubt, we can always turn the record over and play "Love's Old Sweet Song." So wrap up Number 4284, please.

For its orchestration, and for the voice of Frances Alda, we must have Number 1176, on which we will find "The Bells of St. Mary's." And when nostalgia overcomes us we will just take a double dose and turn the record over to play "Ever of Thee I'm Fondly Dreaming." Right after that we will probably begin lashing a raft together and making a sail out of our shirt.

Finally, we've got to have some companionship on this island. And since Brother Proskauer probably will not approve of our idea of taking Rosalind Russell along, we can think of no more companionable fellow than "Jiminy Cricket." So if Mr. RCA or Mr. Victor will kindly see to it that the Pinocchio album (P-18) is included in our baggage we will ask for no other albums. "Give a Little Whistle," "When You Wish Upon a Star" and "I've Got No Strings" should keep us going until the Coast Guard finally shows up.

So, Richard my friend, we can do nicely with this quota of records. Be sure, however, to put in a liberal supply of those RCA-Victor Green Chromium Needles; these discs will stand a lot of playing.

P.S. TO OUR READERS: We've had a lot of fun figuring out our answer to Mr. Proskauer's question, and it occurs to us that you might also enjoy such a mental musical excursion, regardless of what you may think of our choices. So, to the three readers of this column who send in the most interesting list of ten records—with reasons for their selection—with which they think they could get along on this figmentary desert isle, we will award the album, "The Heart of the Symphony," reviewed by this column in November. Lists should be postmarked not later than February 1, 1941, and should be sent to "On the Record," NATURE MAGAZINE, 1214 16th Street, N. W., Washington, D. C.

Nature Recreation

This is the title that William Gould Vinal gives to a significant and valuable book. It is significant because it treats with questions fundamental to the social, economic and democratic processes of life today. It is valuable because it is a practical volume that provides the data necessary to answer these questions. "Cap'n Bill" Vinal writes against a lifetime of experience in Nature education and Nature recreation. It is an outdoor experience born of participation and leadership. He has taught Nature from a variety of viewpoints. He has acquired a wide knowledge of techniques and materials. Thus he has provided himself with the means to winnow the useless from the valuable and to present within the covers of his book a wealth of positive information. He has chosen to divide this volume into two main parts. The first deals with the philosophy of Nature recreation—at home, in the community, at the summer camp and on the trail. One chapter treats with conservation—"A Challenge to the Educator." The second and larger part of the book deals with applied Nature recreation and is packed with practical advice and references; with citation of experiences, and with an amazing amount of material never before gathered in one place. The result is a volume that should be required reading among all those concerned with Nature leadership of whatever sort. His or her work will be by far the better for it. Published by McGraw-Hill, this splendid book sells for three dollars.

Sightlessly in the Woods

Impressed by the beauty and courage of Grace E. Barstow Murphy's article, "Silently in the Woods", in our November issue, Miss Josephine Lee Chrysler of the Pennsylvania Institution for the Instruction of the Blind has called to our attention a passage from *The Blind in School and Society* by Thomas D. Cutsforth. Complementary to Mrs. Murphy's story is a letter to Dr. Cutsforth from a blind man who tells of a solitary walk in the woods. The letter is reproduced here by permission of D. Appleton-Century, publishers of this book.

In a prefatory comment on this letter Dr. Cutsforth points out that it shows that "without visual processes experience may be full and expression unhampered and that the blind can appreciate to the full their own perceptual values". Dr. Cutsforth's correspondent wrote:

"Yesterday I returned from a week's vacation at the upper ranch. Spring in the mountains is even more delightful than in the valley. It is a more sudden and giddy spring. It hits quick, like a crack on the nose.

"At last the Forest Service has justified its existence. Even if it can't save the forest from fires and tourists, it surely can build beautiful trails. This spring the trail crew has just completed a three-foot pack trail from the forks to the lookout station. A large part of my vacation was spent in exploring this trail. Its wide, smooth ledge cuts along the south slope for most of the way to the top, winding around the canyon heads when they are too deep to cross. It has soft dusty fills, noisy, rickety, puncheon culverts, and dizzily teetering, swinging, cable bridges.

"Sunday, the day before I returned, I rose early, long before Wing's straw sandals began to scuff about in the cook house, in order to see as much of the trail as I could and still be back before noon. It must have been about daylight when I set out, for the flickers were just beginning their tattoo upon the old snag back of the corral, and the dust in the trail made that soft, cool, dewy 'pluff' at every step.

"By the time I had put a half mile of trail behind me and had passed most of the marks of civilization, morning and spring broke at the same time. Everything but the fir thickets of undergrowth became filled with activity, sound and odors. Each rod of the trail had its own telltale smell, and every rod presented its own combination of warm sun and cool shade. A quarter of a mile below in the bottom of the canyon some bluejays were cursing out the intruder; perhaps a bobcat, perhaps a fawn. Up the creek, a kingfisher was making his first patrol, sounding his strident claxon as he hunted. Between the trail and the bottom of the canyon, a covey of mountain quail that had been scattered by some early marauder was rebanding. The clear, jerky, whistled calls of the quail rang up and down the canyon and were re-echoed from the opposite ridge. At every turn of the trail my progress was challenged by the throaty bark of the silver gray squirrel, and my appearance sent the jibbering chipmunks dashing in a panic for the brush. Every cool, dank, canyon-head still held its night odors, both living and dead.

"Halfway up the main ridge I sat down on a puncheon culvert to rest and listen. The air was full of early morning woodsiness, the fragrance of pine needles-soft with fungus mould, the vapid sweet of the wild parsnip, cut by the spice of spearmint and azalea blooms. The outing flannel thimbleberry leaves reached high above my head upon their cool varnished stalks. Beneath them twined an undergrowth of dwarf salal, with its stiff, rattly leaves like patent leather tags. Here and there the shoot of a mountain fern was sticking up through the ground, looking more like a clenched, powdered chicken foot than like a plant.

"As the mid-forenoon approached, and the sun became warm, the valley breezes stirred gently in the tops of the pines. It was not long before the entire mountain ridge began to whisper, not in unison, but in parts, first here, then up the canyon, like a sylvan congregation whispering responses. The whispering is but a prelude to the real music of the pines. When the winds become steady and stronger, a soft vocal moan becomes audible above the whispering. It is as though a phantom organ were concealed somewhere. It is truly a phantom, for it is neither here nor there, but softly, silently everywhere."

Chrysanthemum Data

In our November, 1940, issue Andrew S. Wing gave the year 1847 as the date of the introduction of chrysanthemums into the United States. We are indebted to Edwin F. Steffek, assistant editor of *Horticulture,* for correction and further historical data. He writes that in June, 1829, the Massachusetts Horticultural Society offered a premium of three dollars for "the best specimens of Chinese Chrysanthemums, not less than five varieties." The following year the three dollars were awarded to David Haggerston of Charleston. Mr. Steffek also quotes Hovey's *American Gardener's Magazine and Register,* published in 1835, which says: "At what time the first chrysanthemums were introduced into this country we have no accurate account, but we may suppose it to have been about the years 1805-6". Dates of early plant introductions are too often shrouded in the haze of the past, but it is apparent that the date we gave for the chrysanthemum immigration was much too late.

A Tough "Mum"

After five years of selection and controlled fertilization University of Chicago botanists have developed a chrysanthemum that the amateur gardener can plant and forget, except for watering it if Nature fails in the task. It is a flower that blooms about two months ahead of the usual "mum" time, and it will stand temperatures below zero. This new development in the horticultural field was revealed to the public in October at the University's Mill Road Farm estate west of Lake Forest, Illinois. Thirty thousand cuttings and seedlings were on display in the greenhouses and gardens. This represented some three hundred varieties, their colors ranging from white through yellow, bronze and deep red. Most were semi-double or full double blooms.

Cornell Leaflet

Volume 34, Number 1, being the September, 1940, issue of the *Cornell Rural School Leaflet,* is a teachers' number, containing the many useful suggestions for the year's work that is typical of these leaflets.

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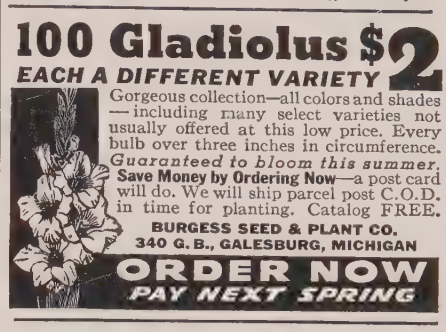
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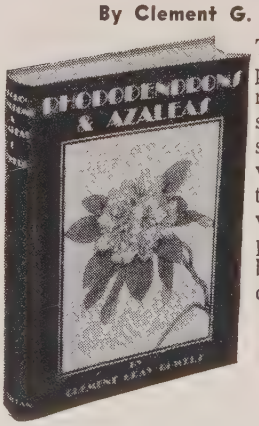

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(Continued from page 7)

camp fires. The examples that Julia M. Seton has preserved are derived not only from Nature but from ghost stories, folklore, and Indian legends. Mrs. Seton's introduction describes her husband's technique of story-telling and calls her selections "the best examples of successful story-telling extant." Seton himself, in a preface, vouches for his wife's qualifications as an editor. Fortunately they both seem to be right, to the possible envy not only of anthologists and story-tellers but also husbands and wives!

Seton's art, so admiringly described by his wife, has certainly enriched the narrative values of the stories he has found. Fortunately, however, a story is a story and even without consummate improvement is something to be treasured. Princess Atalie, for example, with her simply though beautifully-told Indian flower legends in *The Earth Speaks* has collected a golden treasury that will also enrich the library. "From the frozen Susquehanna to the scorching plains of the West," she says, "I found my people dwelling on the legends of beautiful wild flowers conceived of human emotions." The Cherokee princess, a foremost Indian soprano, a painter, and a leader among her people, has not only collected these legends into literature but has illustrated them with a series of drawings that are delightful in their naïve simplicity. *The Earth Speaks* is a book that will be valued by many people, old and young, for its composite picture of Indian ways and for the legends themselves, and those who make such distinctions might call it an ideal Nature book for girls.

As far as boys are concerned, there is no doubt that *The Boy Scouts Year Book of Wild-Animal Stories* is a rip-roaring success. There are no beautiful flower legends mixed up in any of these two dozen thrillers. There is, in fact, little of natural history aside from the main theme, in many variations; namely, that in the presence of enemies or in search for food, wild creatures are dangerous and courageous. There are a few less boisterous stories, some with humor, but in general this is a collection of thrilling narratives with plot interest dominating both scene and character, wild or human.

Seton says that his book *Wild Animals I Have Known* "founded the modern school of animal stories, that is, giving in fiction form the actual facts of an animal's life and modes of thought." As far as the needs of natural history are concerned, Seton has probably gone as far with fiction as is necessary. Franklin K. Mathiews, in his collection, has gone farther; the natural history in it provides an adventurous subject matter, but the book makes only incidental contributions to a boy's knowledge of natural history. It does promote respect for the strength and courage of animals, but it is to be judged mainly as a collection of stories.

There are a few stories of pets in the *Year Book,* but if I were giving it to a boy I should also like to give a copy of Margaret Shaw's and James Fisher's *Animals as Friends and How To Keep Them.* This is an English book primarily, based on experiences and research in London, but, as the publishers point out, the information is useful in other countries. I find, for example, an excellent chapter on flying squirrels and others on animals common as pets in America, and frequent references to American writings. Each chapter deals with the distribution of its subject, its habitat, description, length of life, care and food, housing needs, breeding habits, diseases, and other subjects of interest to keepers of pets or students of wildlife. This is a highly interesting book, valuable for reference too, and if pets are as common in America as in England it should fill a great need, for if animals are to be kept as pets they should certainly enjoy the most intelligent and sympathetic care.

Julian Huxley, in a foreword, says that the pet population in Great Britain "appears to be at least as great" as the human population. Broadcasts of air-raid sirens will be all the more poignant to those who know this, but in the midst of human wars it is also somewhat reassuring to be reminded of animals as friends, both petted at home and respected in the wild.

Lure of the North

Born in Dawson, Yukon Territory, Richard Finnie is a son of the North and, as such, began at an early age to acquire his qualifications for his book *Lure of the North.* He moved into southern Canada for his education, but when seventeen he went on his first Arctic expedition and during the past sixteen years has roamed the northern reaches. On official trips for his government and otherwise, he has photographed the people and the wildlife of the northern country; wintered with the Eskimo; learned the lure of the country to its fullest. His resultant book is concerned largely with the Eskimo, although there is much natural history in it since Eskimo life and wildlife are intertwined. Mr. Finnie writes well and excitingly when the occasion arises. His story is, therefore, entertaining and informative. His publishers, David McKay Company, have collaborated to produce a lovely book physically. This happy collaboration—resulting in the *Lure of the North* at $3.50—will appeal to many.

Garden Magic

In *Green Enchantment,* Rosetta E. Clarkson has written a book that will go on a sparsely-filled shelf in the garden library, for it deals with monastery gardens of medieval times and the beginnings of flower gardening. Its connection with today is, of course, the herb garden, but the book's charm lies in the story of the garden methods, and lore, and plants of a day that is gone. Here we have garden history at its best, written by one who has done long and careful research, who is a garden lover herself, and who writes delightfully. This book is published by Macmillan, and is priced at $3.00.

Men and Apes

Fundamentalists and those with closed minds are warned that they should not read *Why Men Behave Like Apes and Vice Versa* by Earnest Albert Hooton of Harvard. Anyone who employs his mental equipment for exploratory purposes in an effort to discover the reasons the way man behaves will revel in this provocative and splendidly-written book. Certainly with the world—thanks to human behavior—, in the state it is today, there is ample reason for one to seek answers to the question of why man acts as he does. Whether or not the reader will agree with Dr. Hooton's reasoning and conclusions is not important. Many will—and we have found no reason to disagree with him ourselves—but those who do not will have had some mental exercise that cannot help being good for them. It would require far more space than is here available to do thorough justice to this book. In fact, it is one of those volumes that cannot be summed up in a review of even the most generous length; it must be read in its entirety. For our part Dr. Hooton's introductory chapter—included, he says, because so many reviewers get no further and so he chooses that place to get certain things "off his chest"—is worth the price of the book. And that is no reflection upon what follows, for it is of equal calibre. The Princeton University Press has published this volume, placing upon it a price of three dollars.

The Golden Throng

There are few, in our experience, who are able to write interestingly and with authority about insects. Yet the world of insects is one that impinges closely upon man's, and, too, it is varied and fascinating. Most professional entomologists, aware of the vast complexities of their field, write conservatively and stay within the limitations of scientific method. It must, perhaps, remain for one with an ability at popular expression, combined with an enthusiasm for his subject, to draw general attention to his subject. Such a one is Edwin Way Teale, whose earlier *Grassroot Jungles* was an outstanding popular insect book. He has done another, this time on bees, and to the book has given the alluring title of *The Golden Throng.* He became a keeper of the bees and for a year "lived with them," observing their deepest secrets and photographing them, for Mr. Teale is as fine a photographer as he is a chronicler. His book, illustrated with 85 photographs, is something of which its author and its publishers may well be proud. The latter are Dodd, Mead and Company, and the price is three dollars.

Cornell Leaflet

The Finer Side of Life is the title that Dr. E. Laurence Palmer gives to the November, 1940, number of the Cornell Rural School Leaflet, and in it Dr. Palmer has produced an issue that is both different from its predecessors and definitely appropriate to these times. The finer side of life is, of course, enjoyed upon a basis of Nature knowledge and appreciation, and this leaflet is a simple introduction to the means of enjoying it. Its author says that he has not accomplished all that he set out to do, but he has certainly achieved something of which to be definitely proud.

THE BOXER

Illustrations by Diana Thorne

If dog owners wish to become confused let them delve back into the history of the Boxer, a dog whose characteristics and habits entitle it to the growing popularity it is enjoying. However, the origins of dog breeds as we know them today are always a fascinating exploration. But such study is often maddening in the blind alleys and disagreements it uncovers.

The Boxer is an excellent case in point.

One authority will contend that the origin of this breed is shrouded in mystery; that its existence as a breed is of no more than fifty years' standing. Another authority will assert that the Boxer is recorded as domesticated as early as 1800; that it was known by its present name even before that; that its emergence as a definite breed dates back at least seventy years. One canine oracle tells us that the Boxer was evolved from a dog noted as a bull-baiter in Germany and crossed with the English Bulldog that had been bred down from the larger mastiff. Mr. Hitler would doubtless brand this as a foul *canard,* hatched in Downing Street. Another dog student will declare that the Boxer came from the Great Dane and the English Bulldog, while a third will sweep this claim contemptuously away.

To us these conflicting claims merely add interest and romance to the history of this fine breed. We recommend to dog lovers that they read up on the Boxer and arrive at their own conclusions. Two recent books are particularly interesting—*The Boxer,* by John P. Wagner (Orange Judd Publishing Company, $3.50) and *The Boxer,* by Dan M. Gordon (Judy Publishing Company, $2.50).

Whatever the origins of this dog, the animal of today is exceptional. It is an all-

around dog; member of the family who is completely tolerant of children; a good guard-dog with notable judgement; a cheerful fellow who seems to reveal mastiff influence by observing restraint in his barking. Boxers are among the most cleanly of dogs. They love water and enjoy baths, beside constantly giving themselves a grooming. They are home-lovers, and the records show that it takes extreme lack of appreciation and understanding on the part of the owner to make a Boxer into a tramp. For the most part this dog gets along well with other dogs and other domestic animals, a reflection of its natural friendliness. At the same time they have no lack of courage.

Added to all these qualities is a keen intelligence. In its earlier days the Boxer was a favorite in circuses and dog shows because it is keen and willing, and apparently eager to learn and to please.

Even allowing for the extra enthusiasm of Boxer owner or breeder, unprejudiced testimony seems unanimous in approving this dog. And it is this rare combination of characteristics that makes one particularly interested in the lineage of the animal. Which gets us right back to the original argument —and we'll let you draw your own conclusions.

Birds, Trees, Animals

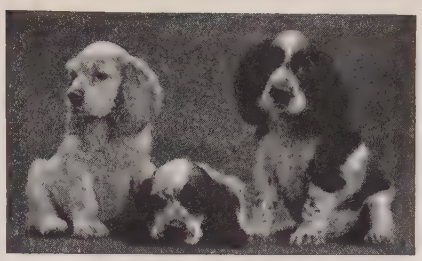
Three interesting and attractive books arrived for review in the same package from Studio Publications, and, since they are related, may well be reported upon together. Two of these are part of a series on drawing, one entitled *How to Draw Birds* and the other *How to Draw Trees.* Their authors are, respectively, Raymond Sheppard and Gregory Brown. Both are practical little volumes with advice to the budding artist, and illustrated with many drawings as examples of how it can be done. They are priced at one dollar each. The third book is entitled *A Book of Animals.* In its ninety-six pages Bryan Holme has assembled one hundred informal photographs and drawings of cats, dogs, horses, birds, farm and zoo animals, selecting his illustrations for their individuality of pose and subject. In his text the author is chiefly concerned with the personalities of the various animals. The book will delight pet owners. It is priced at two dollars.

Dogs as Hobby

Two kennel owners from the West Coast collaborate in the most recent dog book to come to hand. They are Irving C. Ackerman and Kyle Onstott, and their book bears the title *Your Dog as a Hobby.* They have produced a practical guide for the dog owner who wants his dog to get the best out of life and who wants to get the best out of his dog. The authors write with the authority of long and practical experience, telling their story for the average dog lover and not the professional dog raiser. Published by Harper and Brothers, the book sells for two dollars.

Predicting Weather

Many of us fancy ourselves as weather prophets, and are highly critical of the Weather Bureau when Nature tricks it and fails to send the weather that all indications pointed to. There are, however, many factors involved in foreseeing weather changes, and meteorological observations and conclusions are arrived at in most fascinating ways. There has just come to hand, from The Chemical Publishing Company, an interesting book for the amateur weather prophet. It is entitled *Weather Prediction* and is the work of Major R. M. Lester, a Fellow of the Royal Meteorological Society. Although his text is built around British forecasting, weather is weather the world around and thus the book is not seriously circumscribed geographically. It is priced at $4.25, and is illustrated by maps, charts and pictures.



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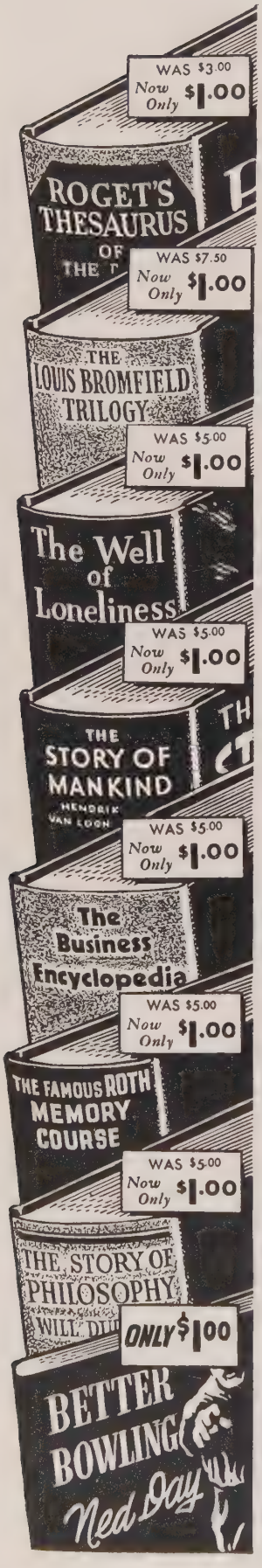

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Our Largest Trees

Had we known of it when Henry Clepper's article in our November issue—"Giant Trees of the World"—was put in type early last summer, we would have incorporated in it the call of the American Forestry Association for reports and pictures of the largest trees in the United States. So we will have to announce this interesting campaign now. Through it the Forestry Association hopes to discover and make a matter of record the largest specimens of more than two hundred different kinds of trees. The movement has the ultimate objective of preserving these giants of the tree world. It will also stimulate public interest in trees and an appreciation of them, both esthetically and economically, and thus be a contribution to conservation. Citizens everywhere are asked to join with those whose callings take them where trees grow, to report the location, ownership and measurements of unusually large trees. The measurements desired are the circumference of the tree, four and a half feet above the ground, its estimated height and the spread of its branches. Photographs of the giants are also desired. This information, along with the photographs, should be sent to the national headquarters of the American Forestry Association, 919 17th Street, N. W., Washington, D. C.

Biological Survey Text

Man and the Living World is the title that E. E. Stanford gives to a textbook the object of which is to "develop a fairly comprehensive organization of principles and facts for text use in what are commonly called biological survey courses." It is a book that would serve as a text in what would be for most college students their only course in biological principles and facts. With this in mind the author has planned his text about "the human body, human interests in living things, and the organization patterns of the living world, both evolutionary and nutritional." He feels that "a survey course should be designed to enhance the thoughtful student's effectiveness in living and to increase his enjoyment of living." The result of this conception is an extremely readable textbook. In fact, it is a book that many people whose college years are in the past could well read with profit and to refresh themselves mentally. Published by Macmillan, this book sells for $3.50.

Story of Weather

We were recently confronted with an imposing list of school homework questions on weather, and several of them sent us to the Association library to aid our offspring with the answers. In fact, we thought some of them rather difficult to be asked children without giving them, at the same time, some guidance to sources of information. There is not, it is true, a large popular library of weather information, although there have been several recent books in this field, the most recent to come to hand being *Rain or Shine*, by Marian E. Baer. This is a book that could very well be added to every junior and senior high school library, to answer the weather questions we refer to. Published by Farrar and Rinehart, *Rain or Shine* is listed at two dollars.

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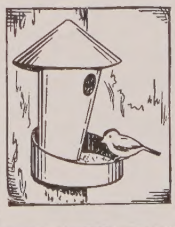

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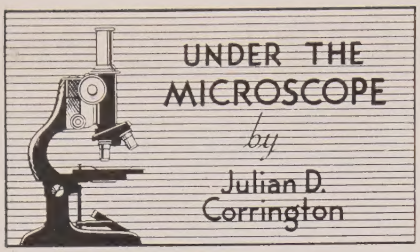


Radiolaria

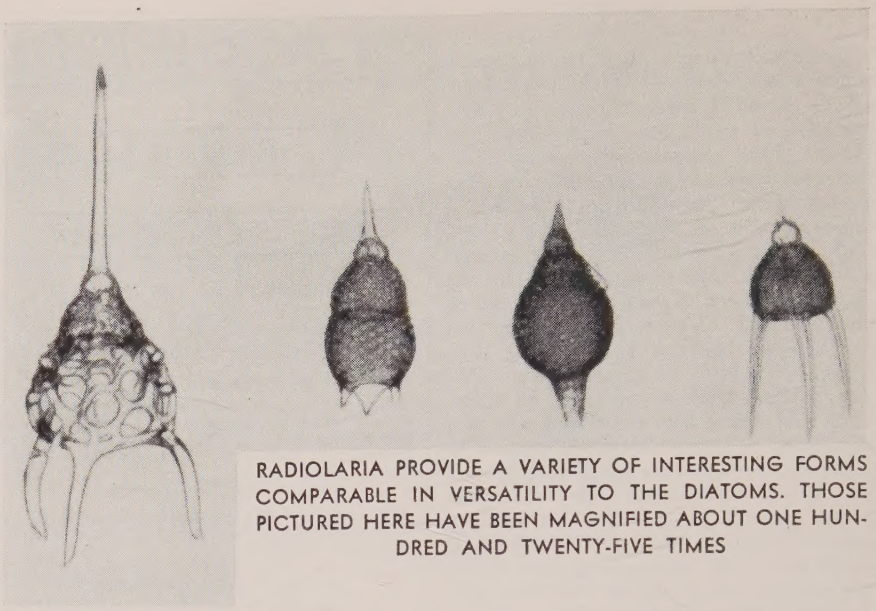
From time to time we have given account in this department of certain groups of organisms that occupy a unique place in the hearts of microscopists because of a combination of minute size with great beauty of form and sculpturing. Thus some general notes on Diatoms appeared in the May, 1938, issue, with techniques for cleaning and mounting in the August-September number of that same year; Desmids were discussed in the May, 1939, department; and Foraminifera in May, 1940. The remaining group of major importance of this type is the subject of our present installment.

Diatoms and Desmids are plants, belonging to the Green Algae. Foraminifera and Radiolaria are animals, members of the Phylum Protozoa and Class Sarcodina, as is also the well-known Amœba. The latter is a naked bit of protoplasm, the other two groups have shells. Diatoms and Radiolaria are provided with shells, in most cases composed of silica, while Forams generally have calcareous (limy) shells.

An enormous number of species of Radiolarians are known, both living and fossil, and they are said to occur as far back as the Pre-Cambrian. Accumulations of their shells have become concentrated over the floor of the deepest parts of the seas, notably in the Pacific and Indian Oceans, where they form radiolarian ooze, one of the sources of shells for slide mounting and obtained by deep sea dredgings. Tripoli stone, used as an abrasive in polishing metals, is made up in part of fossilized shells of these minute creatures.

Radiolaria are exclusively marine and mainly pelagic—living in the surface waters—although they have the power of descending to deeper water during storms. The living cell exhibits one or more nuclei and the cytoplasm is divided into an inner and outer zone by a perforated membrane, the central capsule. This separates an inner layer, concerned with reproduction, from an outer one having duties of nutrition and flotation, made possible by a frothy, vacuolated construction. Small organisms, such as other protozoa or copepods or diatoms, are ingested by the stiff, rod-like pseudopodia, but in the absence of such food materials nutrition is still possible through the agency of the so-called "yellow cells" of the outer layer—actually zooxanthellae which live symbiotically within their radiolarian partner and manufacture food in the fashion of plants. Formerly thought to be algae, these yellow cells are now considered as modified dinoflagellates or chrysomonads—small organisms claimed by both botanist and zoologist.

Chief interest in microscopy centers around the skeleton, nearly always present and generally siliceous. As with diatoms and forams there is great variety in both pattern and detail; radiating spines, lattice-like spheres, concentric spheres—one within another—and combinations of these; ornamentations of hooks and spines; and general form of rings, discs, spheres and helmets all unite to make these highly microscopic objects among the world's most beautiful sights.



RADIOLARIA PROVIDE A VARIETY OF INTERESTING FORMS COMPARABLE IN VERSATILITY TO THE DIATOMS. THOSE PICTURED HERE HAVE BEEN MAGNIFIED ABOUT ONE HUNDRED AND TWENTY-FIVE TIMES

Most readers will have little or no opportunity to collect specimens for themselves, but concentrates from Bermuda or Barbados sands can be secured by exchange or purchased at slight cost from supply houses. Barbados earth is a well-known fossil deposit, a small lump of which is sufficient for many slides. One of the best methods is that of Johnson, who breaks the lump into small fragments and boils them for thirty minutes in a mixture of three to four ounces of ordinary washing soda (sal soda) in a pint of water. Pour off about nine-tenths of this water into a large glass vessel and gently crush the remaining mass. Add soda and water as before, boil again, and once more pour off nine-tenths of the fluid into the glass vessel. Continue until the earth is thoroughly broken up. Meanwhile the radiolaria have floated off in the several portions poured into the glass vessel. Stir this water and allow to settle, when the specimens will be found on the bottom and the liquid above them may be discarded.

It is generally necessary to take the mass of radiolaria thus obtained and go through the whole process again, from the beginning. When the second set of boilings and decantings has been completed the sediment is put in a jar with about one-half ounce of water plus one-half teaspoon of bicarbonate of soda. When dissolved, slowly and carefully add one ounce of strong sulphuric acid. This treatment liberates the individual shells and leaves them beautifully transparent. Wash thoroughly in water to remove all traces of acid and soda and bottle in distilled water until ready to mount.

Dry some of the shells on a slide over an alcohol lamp, then add balsam, cover glass props and finally the cover glass itself. Broken bits of a cover make the most suitable props. Arranged slides, either circle, exhibition or type, are made by picking up a single shell with a bristle or mechanical finger and placing it upon a minute spot of gum tragacanth in the desired position. Breathe on the gum to soften it just before affixing the specimen. Radiolaria may be studied and photographed by either transmitted or vertical illumination, but are especially beautiful and brilliant by dark field.

Beginner's Primer

Our survey of insect orders has now reached to the point where we encounter three orders that have been placed by some authors in a separate sub-class, the *Hemimetabola,* the three being the Ephemerida, Mayflies; Odonata, Dragonflies and Damselflies; and Plecoptera, Stoneflies. Distinguishing the three apart from all others is based on the fact that the larvæ, known in these groups as *naiads,* are aquatic and show certain structural modifications for life in the water. While they resemble their corresponding adult stages in some respects, they differ markedly in others; thus they are more or less intermediate between the Heterometabolous insects, like the grasshopper, in which the young resembles the adult quite closely, and the Holometabolous orders, as the butterfly, in which the young does not at all resemble the adult.

Refer to a dictionary, encyclopædia or textbook of entomology for illustrations of both naiad and adult stages in these groups, of which we will consider the first and last at this time, leaving the Odonata for later treatment, as they need greater attention.

Mayflies are all too well known by those of our readers who live in the Great Lakes region. One species, *Ephemera simulans,* the Lakefly, matures in immense numbers about the third week in July, and we have seen summer cottages almost snowed under by their dead bodies on the day after such a visitation. The scientific name of the order is from the Greek *ephemeros,* lasting but a day, and well describes the duration of adult life, which varies from a few hours to no more than a few days. The appearance and shape of these insects are very characteristic and once seen are to be remembered. Each of the two pairs of wings is triangular, and the two of a side together also triangular, the hind wings being much smaller than the front ones. Both pairs are membraneous and net-veined. The mouthparts of the adult are so greatly reduced as to be almost completely wanting, while the alimentary canal contains air only, the insect taking no food. There are two or three long slender filaments projecting from the rear of the abdomen.

The female mayfly lays her eggs on the water or actually goes beneath the surface and deposits on submerged stones. The eggs hatch into the naiad stage, which is long-

lived, from a few weeks in certain cases, to several years in others. The naiad grows slowly and feeds on vegetation, some of them burrowing, others climbing about over vegetation, still others clinging tenaciously by claws to stones in swift water. They breathe by means of tracheal gills, usually situated in a row along each side of the abdomen, and they have well-developed mouthparts of the biting type.

When mature, the naiad crawls up some plant stem, out of the water, moults to a winged stage, and flies away. Within a few minutes in some species to twenty-four hours in others, this insect moults again; the only instance in all the great array of insects in which a moult is performed in the winged, adult stage. Accordingly, the stage between these two moults of the naiad, after it is mature, has been termed the *subimago;* the creature appears to be an imago (adult) because of the wings, but is actually not so since it has one more moult to undergo.

Economically, mayflies are important as fish food in both stages. They are not destructive and hence their account is entirely on the credit side of the ledger.

The Stoneflies, Order Plecoptera (Greek, plaited-wing), comprise a small group of common but inconspicuous insects found around swift streams and the shores of lakes. Cast skins, left by the naiads that have crawled forth on a stone or stem of vegetation to moult to the adult state, are common sights in such places. The naiad, from one-half to one and one-half inches in length, is exceedingly flat, and as it clings tightly to the underside of a submerged stone, looks more like a fossil or an engraving than a living insect; in spite of which it constitutes one of the favorite foods of fishes, especially of the brook trout. The antennæ extend out in front, the two caudal filaments behind, and the six legs, each bent at a right angle in the middle, to the two sides, making their appearance characteristic. They breathe by tracheal gills, usually located one in rear of each leg; some species have none.

The adult is unattractive and flat, with two long and tapering antennæ and two abdominal bristles. The wings are membraneous, the hind pair generally much larger than the front ones, and folding in plaits like a fan. The mouthparts vary from rudimentary to strongly developed and are of the biting type. Mostly they are innocuous, but one species in Washington, the Salmon Fly, has become a pest on budding fruit. Another, the Snow Fly, is remarkable as appearing in winter, being seen on the snow in warm days.

Aside from mounts of the wings, chief interest in microscopy centers in the tracheal gills of the naiads, and technique with these will be taken up with similar work on the Odonata, in the next installment. These naiads also make most interesting whole mounts.

Historical Outline

Throughout most of the seventeenth century there was a considerable competition between simple and compound microscopes, with advocates of each type putting forth claims of superiority over the rival instrument. Robert Hooke, whom we shall meet at greater length in a future installment, may be taken as representative of designers and users of the compound microscope, while Leeuwenhoek championed the simple, and brought it to a higher peak of development than at any time before or since. After the great Dutch amateur the simple microscope gradually declined in favor as the compound instrument gained in performance, through slow improvement, but remains with us today in many forms, as the hand or pocket lens, tripod magnifier, reading glass, watch-maker's loupe, linen tester and dissecting microscope.

Antoni van Leeuwenhoek (1632-1723) was born at Delft, Holland, in a family of wealthy brewers. As recounted by Locy, his education appears to have been limited, as at sixteen he went to Amsterdam to take a position as bookkeeper and cashier in the clothing firm of a relative. Returning to Delft he married when twenty-two and six years later took a minor office in the local court as "Chamberlain of the Sheriff." The duties were those of a beadle—one biographer refers to Leeuwenhoek as a janitor—and the stipend was £26 per year. He held this post for thirty-nine years thereafter, and the pay was then continued for the remainder of his long life of ninety-one years.

The time required of Leeuwenhoek in his official capacity was very little, in keeping with the salary, and being financially independent he could follow his own preferences and so took up microscopy as a hobby, just as a man in similar circumstances today might adopt television. He became the world's first as well as the greatest amateur microscopist and rose to an eminence in the scientific world seldom equalled since by any self-trained person who did not have the advantages of a formal university education.

Leeuwenhoek learned to grind exceedingly minute lenses by using diamond dust, and during his long, quiet, but most fruitful life he made a total of 419, of which 247 were mounted as simple microscopes in various styles of frames, and 172 were set between plates of metal. Three of these lenses were of quartz, the remainder of glass; two of the microscopes had a double lens, one was a triplet; more than half the lenses were mounted in silver, three in gold.

He left a cabinet containing 26 of his silver-mounted microscopes to the Royal Society of London, and Henry Baker in his *The Microscope Made Easy* (1742) described his inspection of these and stated that the lenses were in fact biconvex, and not spherical as some had claimed. Soon afterward this cabinet disappeared and no trace of it or its 26 microscopes has been discovered from that day to this. What a priceless find should anyone of present or future generations be so fortunate as to unearth the entire collection, or even a single instrument! Are they still in existence, hoarded among the secret possessions of some family, or lying unrecognized in some obscure chest? Or were they destroyed, possibly melted up for their silver? No one knows the answer to this mystery of science!

Nor do we know the fate of the vast majority of all of Leeuwenhoek's many lenses and microscopes. One of the originals is a prized possession of the University of Utrecht. Replicas have been made for commemorative purposes by Bausch & Lomb, and a known original was illustrated in our February, 1939, issue (page 80), along with a portrait of the great amateur, and a third illustration showing how the Leeuwenhoek microscope was used.

In the Utrecht specimen the lens occupies a central aperture in two plates of copper, between which it is held. On one face there

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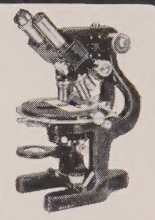

At right is the Bausch & Lomb DDE research microscope. With usual lens equipment it sells for $774.50. It is doing useful work in many of the world's most famous hospitals and research laboratories. At left is the Model R, a microscope built for amateur use. It was designed by the same scientists responsible for the DDE, is built in the same factory, to Bausch & Lomb precision standards. Complete with case and 455-page book written by Dr. J. D. Corrington, it sells for $21.

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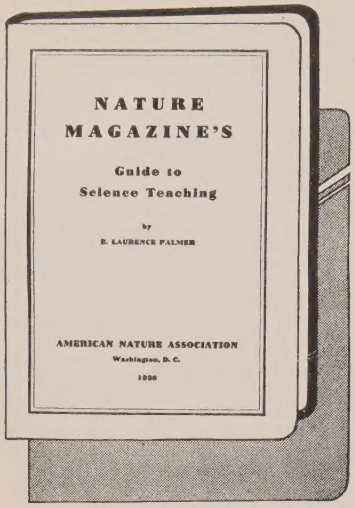

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is an object holder, operating on a swivel, and with two screws to permit focusing. The observer holds the frame very close to the eye, facing a light, and views the object by transmitted illumination. It is said that while the field was small the definition was better than with the compound instrument of Hooke. Locy gives a range of 40 to 270X as the magnifying powers of Leeuwenhoek's various microscopes, while Singer expresses the belief that the highest magnification obtainable was 160x.

In our next chapter we will tell you what it was that Leeuwenhoek saw through his tiny lenses, and what he did about it.

Trade Notes

Dissecting instruments are ever in demand by the microscopist. Even those specializing in non-biological fields need forceps, needles, scissors and knives for preparation of material. An interesting 16-page, fully illustrated *Catalog of Dissecting and Laboratory Instruments* has been issued by the Standard Scientific Supply Corporation ("Stanscien"), 34-38 W. 4th St., New York City, and includes a 6-page illustrated insert on osteology, listing a large number of skeletal preparations. In the main catalog are dissecting instruments of all kinds, singly and in kits, reagents such as Clarite and Parafilm, incubators, ovens and slide warming tables. To secure a copy, send a three-cent stamp to Julian D. Corrington, Nature Magazine, 1214 Sixteenth St., N. W., Washington, D. C. The supply being limited, we reserve the right to substitute another booklet in case our stock of this catalog becomes exhausted.

Transeau, Sampson and Tiffany, *Textbook of Botany*. Reviewed by Roy M. Chatters, Washington College, Chestertown, Md.

This recently published volume exemplifies the modern trend in botanical teaching—a trend toward making it an integral part of everyday life. This tendency is shown by (1) the seasonal approach to an acquaintanceship with botany, (2) the use of native plants instead of exotics as typical representatives of groups, (3) emphasis upon the close physico-chemical relationship which exists in nature between plants and animals, and (4) the increasing tendency away from pure anatomy and morphology toward a greater stress of physiology and taxonomy.

Other features which recommend this book are the refreshingly new illustrations; the short yet complete and comprehensive chapters; the splendid discussion of fruits, origin of food plants, and clarification of the problem of presenting the names of plants and plant parts. The authorship is understandable to the general reader and amateur who pursues botany only as a cultural course and at the same time does not sacrifice those basic principles so necessary to the student preparing for advanced work. In several chapters the writers, who are primarily physiologists, have inserted far more organic chemistry than the average reader can or will attempt to understand. However, one may skip over such material, which does not detract from the excellence of the work from the viewpoint of John Doe, or may profit by such inclusions if one's previous training permits. Pp. xi, 812; figs. 424; tables, graphs, references. Harper & Brothers, 49 E. 33d St., New York City. $4.00.

A.S.A.M. Notes

Since our last issue another Chapter of the Society has been installed, this time right under the shadow of Nature Magazine's offices in the nation's capital. Through original efforts of Samuel Gordon, followed recently by those of Jesse Clough and Mrs. Maud Spalding, the Washington Chapter was launched on November 7 and elected Mr. Clough President, Donald M. Brown Vice-President, and Mrs. J. N. Krum Secretary-Treasurer. Eleven members signed the chapter petition card. Mr. Clough gave demonstrations of micrometry, mounting, staining, and exhibited homemade devices including a slide-dryer, turntable and dark-field element. Microscopists in the vicinity of Washington, D. C. are invited to attend meetings and for further information should address either Jesse R. Clough, 15A Bates St., N.W., or Mrs. A. W. Spalding, General Conference Office, Takoma Park, D. C.

Sidney Monas, President of the Bangor, Pa., Chapter, writes that after the opening of the high school term this fall, there were four vacancies in the limited Chapter membership of ten, and then when announcement to this effect was made, over fifty applicants appeared! The Chapter voted to extend their group to 25 members and look forward to a year of intensive and successful activity. They have been highly commended by the B. H. S. science department, have received much favorable publicity in the school magazine, local newspaper and elsewhere, and have begun a small library on microscopy. Any reader having an extra copy of some book or magazine bearing on the subject can consider this announcement as a gentle hint from ye editor.

Members of Chapters don't forget the Chapter itself as Christmas comes around; a little extra donation by everyone will get that book or that instrument or accessory you have all been wanting. A little publicity drive, some prompting here and there, a benefit exhibition—one way or another—and you may find that non-members in the community, approving of the success of the organization and wishing to do a bit in helping friends, may present the Chapter with badly needed equipment.

Microscopists and potential peekers through the eye of a thousand wonders: if you live in any of the following communities, get in touch with the organizer named, and join the new Chapters now being formed.

Philadelphia, Cyrus H. Chappell, 4027 N. Darien St.

Moscow, Idaho, Ted Bank, Jr., 820 West C St.

Rochester, N. Y., John P. Gast, 592 Hayward Ave.

Washington, D. C., Jesse R. Clough, 15A Bates St., N. W.

Manhattan, New York City, Saul Gordon, 10 Cooper St., or Henry Franklin, 1344 Lyman Place.

Brooklyn, N. Y., Cornelius Denslow, Brooklyn Children's Museum, where one Chapter for adults and another for juniors are being formed.

MERRY CHRISTMAS